THE ROLE AND SIGNIFICANCE OF BULLOCKS AND HORSES
IN THE DEVELOPMENT OF EASTERN AUSTRALIA
1788 to 1900

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3. B.H. Slicher van Bath ibid.


7. G.N. Blainey The Tyranny of Distance, Melbourne, 1966; For a detailed discussion of camels in Australia see T.L. McKeight The Camel in Australia, MUP, 1969; See also Technical Appendix VI.

8. Full bibliographical data on the literature discussed below can be found at the Select Bibliography.
FOOTNOTES: CHAPTER 2.

1. Historical Records of Australia, Series I, Volume 1, p. 1. Hereafter all references will be to Series I unless otherwise noted and the form used will be HRA, Vol., page, etc.

2. HRA, 1, pp. 10-11.

3. Ibid., p. 10.

4. HRA, 1, p. 12. See also Geoffrey Blainey's recent argument on the importance of confusion about the nature of Botany Bay's climate. A Land Half Won, Melbourne, 1980.

5. HRA, 1, p. 22; HRNSW, Vol. 1, Part 2, pp. 105-120.

6. HRA, 1, p. 52.

7. HRA, 1, p. 52.


9. HRA, 1, p. 490ff.


11. HRA, 1, p. 52.

12. HRA, 1, p. 50.

13. HRA, 1, p. 65.

14. HRA, 7, p. 579.

15. HRA, 1, pp. 45, 54, 96, 249, 375 and 338.


18. HRA, 1, p. 530; 2, p. 488 and 673.


20. J. Hunter, An Historical Journal of Events at Sydney and at Sea 1787-1792, John Bach (ed.), Sydney, 1968, p. 24. The rejection of the sling was foolhardy; it was to become a common means of giving short-term protection and support in transporting horses at sea during the nineteenth century.


22. Ibid., pp. 417-8, p. 530.
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24. Suggestions for improving the transport of horses and cattle had been made from 1793. Lieutenant Bowen wrote to Under Secretary King that the proper fitting out of ships was the first major step to reduce mortality. The space between decks needed to be at least five foot six inches to provide adequate room and ventilation. The deck needed battens to stop the animals from slipping and falling. Moreover, he emphasised the need to reduce sailing times. HNSW, Vol. 2, p. 48. Strong suggestions concerning adequate water and fodder supplies were part of an offer by Captain Hogan to supply the colony with 140 cattle for an all-up cost of 35 pounds a head or 4900 pounds in all. The price, the growing success of imports and the increase in stock numbers probably caused the authorities to reject this offer. HNSW, Vol. 3, p. 300.


27. HRA, 2, p. 632.


29. Ibid., p. 485.


31. HRA, 2, p. 610.

32. HRA, 4, p. 76.


34. HRA, 9, pp. 60-1, for Macquarie's observations on the rapid improvement of the colony's cattle.


38. HRA, 1, p. 10, and later volumes for the repeated emphasis given to all the Governors from Phillip to Macquarie that the herds must not be used for rations. This was a sound policy since until almost 1820 the annual
consumption rate was greater than the natural increase and in many of the earlier years greater than the total stock.


40. Bathurst to Brisbane, 31 July 1823, HRA, 11, p. 101. Most were used as rations, some were sold and a number used for draught. Note the wild cattle are not included in the figures in the table.

41. HRA, 1, p. 442.

42. D. Collins, op.cit., Vol. 2, p. 116 and p. 120 for details of Campbell's cargo on the Hunter in 1798. See also details of the officers' purchases from Brampton's shipment in 1793 in J.C. Garran, 'William Wright Brampton and the Australian Merino', Journal of the Royal Australian Historical Society, Vol. 58, March 1972, Part I, pp. 1-12, hereafter RAHS; Hunter to Portland, 20 March 1796, in HRNSW, Vol. 3, p. 78, notes that he has given his encouragement to the officers purchasing stock previously issued to small settlers, to prevent the slaughter of these cattle.

43. HRA, 5, p. 463.

44. HRNSW, Vol. 4, p. 657.

45. E.A. Beever 'The Origin of the Wool Industry in New South Wales' Business Archives and History, Vol. V, pp. 93-5, pp. 100-1, p. 106. Also 'Further Comments on the Origin of the Wool Industry in New South Wales', AEHR, Vol. VIII, No. 2, 1968, pp. 126-7. It is considered that while some graziers did concentrate on the development of improved sheep types the early preoccupation was with building up herds of livestock for their own sake. This was partly as a store of wealth and partly for market gain. This thesis seeks to demonstrate that cattle had the dual purpose of profits for meat, hides and tallow and for draught work. They were the most common and reliable form of draught power for the first fifty years of the colony's development.


47. B.H. Fletcher, op.cit., p. 87.

48. See the reports of the Governors Phillip to King, HRA, 1 to 4; HRNSW, Vol. 4, p. 181 and p. 200.

49. HRA, 4, p. 347.

50. HRA, 2, p. 610; 3, p. 429 and 4, p. 245.

51. HRA, 5, pp. 34-7, pp. 604-7; 6, pp. 162-5; 8, pp. 568-76; L. Macquarie, Tour over the Western or Blue Mountains, 1815, Macquarie Papers, ML, Sydney.

52. HRA, 11, p. 101.

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55. See the report on Spanish greys of Cape Colony before Lord Somerset introduced English horses after 1795, in APR, 15 Jan. 1897, p. 560.


57. R. Dawson, The Present State of Australia, London 1830; see also the Australian Agricultural Company, Dispatches 1824-1830, 78/1/1, ANU Archives, Canberra.

58. B.H. Fletcher, op.cit., p. 28 and p. 91.

59. HRA, 2, p. 610.

60. G. Caley Reflections on the Colony of New South Wales, Sydney, 1803, p. 60; See Table 2.6: Government and Private Ownership of Horses, Cattle and Oxen in New South Wales 1795-1820.

61. HRA, 1, p. 506. See also Fletcher op.cit., p. 65. In 1801 the officers owned 91.9 per cent of the cattle and 84.8 per cent of the horses. Thereafter their share fell until 1808 when the figures were 34.2 per cent and 25.4 per cent.


63. HRA, 4, pp. 34-5, p. 77.

64. HRA, 4, pp. 340-1.

65. HRA, 3, p. 597.

66. HRA, 1, p. 678, 2, p. 21.

67. HRA, 2, p. 590; Fletcher has correctly shown that government pastoral activity was successful in building up basic breeding herds but it was singularly unsuccessful in its task of providing the colony with a supply of meat during its first twenty years. B.H. Fletcher, op.cit., p. 39. Between 1800 and 1808 the herd had grown from 765 head of cattle to 3,612 but this had only provided minor supplements of meat. Fletcher shows that even by 1806 the whole government stock only accounted for little over one year's supply of meat rations.

68. HRA, 6, pp. 145-7.

69. HRA, 6, p. 168.

70. See HRA, 7 pp. 107-108 and B.H. Fletcher, op.cit., p. 71. The arrangement with King whereby Bligh received extensive grants of land,
stock and equipment at public expense compromised his position as a reformist governor. See ibid., pp. 113–4.

71. HRA, 7, pp. 251-2 for 1810 and 10, p. 344 for a strong statement of his

72. J.D. Lang, Historical and Statistical Account, London, 1875, pp. 196-9; See Table 2.6 for cattle numbers.

73. HRA, 1, 7, pp. 742-8. A breeding herd of 1,000 head was established and serviced by the best bulls. This herd was divided into smaller herds so the English Cape Colony and Bengal cattle were prevented from breeding indiscriminately. Greater control was enforced to ensure that cattle were used in the best way for breeding, rations and draught work.

74. Ibid., pp. 745-6.

75. In 1806 G. Blaxland purchased eighty cows from the government herd for 2,240 pounds for use in breeding with his stud bulls. C.J. King op.cit., p. 535.

76. HRA, 7, p. 380.


78. HRA, 11, p. 101.

79. HRA, 7, p. 628.

80. Note the horse was a vital element in the colonial government's system of law enforcement. The horse was also status symbol. See B.W.Tuchman The Proud Tower Portrait of the World Before the War, 1890-1914, N.Y., 1972, pp.25-9 for a description of the importance of the horse as symbol of status and power in British society. Colonial society gave perhaps greater emphasis to the horse.

81. Given the common usage of the term 'cattle' to describe both horses and cattle the instructions on the conservation of cattle might be assumed to include the approach to horses. If this was the case then the various governors did little to stimulate the breeding of greater numbers of horses. The division of returns into cattle, oxen and horses suggests that this broad use of the term lost its early use.

82. HRA, 1, pp. 1-15.
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1. HRA, 1, p. 182.


3. HRA, 1, p. 59.

4. The small numbers of stock imported meant that for the first four decades of settlement breeding up cattle and horse was the first priority. The delayed introduction of draught horses contributed to the long period of bullock use in haulage. See Section I Chapter 6.


7. See the reminiscences of the convicts Henry Hale and Joseph Smith who worked like yoked bullocks hauling timber, stores, food and bricks, in C.J. King, op.cit., p. 30. Also accounts by R. Terry, Reminiscences of Thirty Years Residence in New South Wales and Victoria, London, 1863.

8. For later examples of this attitude see HRA, 10, p. 279 (1820) and p. 680 (1822). The debate about the reasons for the settlement of Australia are fairly thoroughly developed in Ged Martin (ed.), The Founding of Australia, Sydney, 1978. Recent contributions are to be found in G.N. Blainey, A Land Half Won, Melbourne, 1980, Chapter 1 and notes pp. 364-365; and Alan Frost, Convicts and Empire - A Naval Question 1776-1811, OUP, 1980, passim. The use and methods of employment of convict labour were reviewed in the Molesworth Report and by J.T. Bigge in his reports. The essential point about these reports was that the convicts were seen in a changed setting. The colony had moved beyond its original purposes and thus each report seeks to give a new direction to rationalising further transportation and employment of convicts.

9. HRA, 1, p. 483.

10. S.M. Onslow, op.cit., p. 47.


14. HRA, 8, p. 662.


16. HRA, 7, p. 275.

17. HRA, 7, p. 604.

18. HRNSW, 7, p. 594.
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1. HRA, 1, p. 182.
2. W. Tench, _op.cit._, pp. 223-38.
3. HRA, 1, p. 59.

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9. HRA, 1, p. 483.

10. S.M. Onslow, _op.cit._, p. 47.


14. HRA, 8, p. 662.

15. J. Jervis, _op.cit._, pp. 54-7.

16. HRA, 7, p. 275.

17. HRA, 7, p. 604.

18. HRNSW, 7, p. 594.
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20. HRA, 7, pp. 604-5.
27. See Statistical Appendix D: Price Range of Cattle and Working Bullocks and Appendix E: The Price Range of Horses, etc.
28. HRNSW, Vol. 3, pp. 521-26 records the repair of such vehicles in 1798. By 1799 the records show that both wheels and vehicles were being built. See pp. 749-54. At first English wood was considered essential for various parts, such as ash for the fellos, but local timbers were gradually identified as being suitable. D.N. Jeans, An Historical Geography of New South Wales, Sydney, 1972, p. 87.
29. M. Colwell, Australian Transport: An Illustrated History, Sydney, 1972, pp. 12-3; G.N. Blainey, Tyranny of Distance, Melbourne, 1966, pp. 123-4. A dray can be pulled to one side so that one wheel and then the other can be waddled over an obstruction without unduly upsetting the balance. A wagon with small front wheels required more direct draught to haul the wheels up and over the obstacle. This required more power and created greater instability of the load if a waddling or one wheel at a time approach was used.
30. See also Technical Appendix A: The Resolution of Draught Power.
31. This section of the text relies on careful analysis of drawings and paintings of this period.
32. See Table 2.6 at Chapter 2 for numbers of working bullocks.
34. See Statistical Appendix A.
35. Sydney Gazette, 6/10/1810.
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37. HRA, 4, p. 474. The cost of hiring a horse in 1803 was twenty-five shillings a day, of which forage made up the greater part of the charge.

38. See Statistical Appendix C: The Number of Horses in New South Wales 1788-1830.

39. George Caley entered into a long feud with John Macarthur when the latter demanded that Caley remove himself from the roadway to let Macarthur ride past. See Caley's letters to Sir Joseph Banks complaining of Macarthur's behaviour. G. Caley, Reflections on the Colony of New South Wales, Sydney, 1803.

40. S.M. Onslow, op.cit., p. 298. See also Macarthur Papers, Accounts: Saddlery, Coachwork and Veterinary, MSS, A4291, ML, Sydney.

41. See details of Marsden's rides in G. Mackaness, Some Private Correspondence of the Rev. Samuel Marsden and Family 1794-1824, Sydney, 1942, p. 36.

42. Boats were, even in the face of London's disapproval, built to perform a wide range of tasks on the rivers and the harbour. See the thorough discussion of the development of colonial shipping in D.R. Hainsworth, 'The New South Wales Shipping Interest 1800-1821: A Study in Colonial Entrepreneurship', AEHR, Vol. 8, No. 1, 1968, pp. 17-30.

43. D. Collins, op.cit., Vol. 2, pp. 25, 177; Sydney Gazette, 1798; B.H. Fletcher, op.cit., p. 84n.

44. G.N. Blainey, op.cit., p. 120.

45. C.J. King, op.cit., p. 523; B.H. Fletcher, op.cit., p. 234.


47. Ibid.

48. Ibid., p. 524, King notes reports carried in the Sydney Gazette.

49. Cox's evidence quoted in C.J. King, ibid., p. 525.

50. HRA, 8, p. 195 and p. 595. These figures may understimate the total since the recorded sailings do not cover a full year.

51. For details of the amount shipped see HRA, 8, p. 195 and p. 595; for output figures and acreage see B.H. Fletcher, op.cit., p. 229 and p. 237. The calculations have been developed from this data. Even if the shipping totals recorded are adapted for the whole year and then doubled for both 1813 and 1815 the volume shipped via the Hawkesbury still suggests a downward trend from about one half to one quarter of output.
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52. The largest shipping volumes in the colony were timber and coal from Newcastle. HRA, 8, p. 195 and p. 595.

53. This is confirmed by the research of M.E. Robinson, The New South Wales Wheat Frontier 1851 to 1911, ANU, 1976, pp. 14-47 and especially pp. 20-1.


55. Ibid.

56. The critical comments that Macquarie was blind to the limitations of the convict system are coloured by hindsight and underplay the vital role he played in providing the basic and necessary infrastructure which allowed for greater economic growth. To be critical of his limited view of political development puts the cart before the horse. The development of firm or firmer economic foundations provided the starting point for the later political changes. See F. Watson (ed.), HRA, Vol. X, pp. xvi-xvii.


58. C.J. King, op.cit., p. 525.


60. HRA, 8, pp. 152-3.


63. HRA, 9, pp. 4-8 and pp. 11-15ff.

64. J.T. Bigge, op.cit. (3), pp. 40-1. The Parramatta toll was abolished in 1866 and that of Penrith in 1878. J. Jervis, op.cit., pp. 57-8; in 1813 Macquarie reduced the tolls on the Windsor road from eighteen to twelve pence for carts and from thirty to six pence for horses in order to stimulate traffic. HRA, 8, p. 625, Sydney Gazette, 20 Nov. 1813.

65. HRA, 7, p. 604; Sydney Gazette, 20/11/1813, 27/11/1813.

66. Sydney Gazette, 19/7/1815.

67. Bigge Appendix, Bonwick Transcripts, Box 2, MSS, ML, Sydney.
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68. G. Mackaness, loc.cit.


71. HRA, 10, pp. 696-97.

72. HRA, 8, pp. 314-5.

73. HRA, 8, pp. 467-8 and p. 558.


75. G. Mackaness, op.cit., p. 117.

76. HRA, 8, p. 558.

77. C.J. King, op.cit., p. 525.


80. For details of this plan see 'Journal kept by W. Cox Making a Road Across the Blue Mountains from Emu Plains to a New Country Discovered by Mr Evans to the Westward', in G. Mackaness (ed.), Fourteen Journeys Over the Blue Mountains in New South Wales, 1813-1841, Sydney, 1965, pp. 35-8, 40-2, 61-2.

81. Ibid., p. 72.


83. Ibid., p. 423; see David Denholm, The Colonial Australians, Penguin Books, 1979, pp. 91-2, for a wise and sensible discussion of the early formation of tracks and roadways.

84. G. Mackaness, op.cit., p. 251.


86. Film report by the Leyland Brothers, GTV9, 20 September 1980. 'The Great North Road of Early New South Wales'.

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88. HRA, 14, p. 70.

89. The salaries for the surveyors and superintendents and the forage allowance for their horses totalled 1,622 pounds compared to the 1,211 pounds raised each year from ferry and toll charges. HRA, 13, p. 50.

90. HRA, 14, pp. 72-3.

91. HRA, 12, pp. 384, 418.

92. See Surveyor General Oxley's report at HRA, 14, p. 303 on the problems of building a complete road system. See also the discussion of the settlers lack of power to prevent the right of way of stock and vehicles in E. Dunsdorf's, op.cit., p. 65.

93. Estimated on the basis of one team to move two tons of dry rations for each group of two hundred men and each main gang having one or more teams for heavy work.


96. Ibid., pp. 27-8.


100. Ibid., pp. 33-4.


102. HRA, 11, p. 657.


104. J.T. Bigge (3), op.cit., p. 78.

105. See Chapter 2 Section II.

106. This is based on the conservative figure of feeding each animal ten pounds weight of hay or chaff per day.


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112. G. Dow, op.cit., p. 91.


114. M. Stringer, Australian Horse Drawn Vehicles, Adelaide, 1980, p. 23 and I. Badger, op.cit., p. 7. In the 1820s the Phaeton also became popular for town use. The cost of this vehicle began at one hundred and twenty pounds with a set of harness.


117. HRA 9, p. 253; and 13, p. 456; I. Badger, op.cit., pp. 8-9.


119. For some details of the number of people killed in horse vehicle accidents see Census of New South Wales, November 1828, op.cit., pp. 418-20.

120. The considerable expenses of these items, for a large establishment, are shown in Macarthur Papers, Second Series, Coach Building, Saddlery and Blacksmithing Accounts, A4291, MS, ML, Sydney.

121. See the emphasis given to revisions of the conventional view of development of the colony by G. Abbott and G. Little, who give emphasis to the importance of urban speculation and growth especially in the 1830s. G. Abbott and G. Little, The Respectable Sydney Merchant A.B. Spark of Temple, SUP, Sydney, 1976, p. 3.

122. See Table 3.5: Transport and Related Employment, N.S.W. 1828.


124. HRNSW, Vol. 6, p. 352. Bligh noted the lack of real interest in growing hay and claimed he was the first to build a hay stack in the colony.


126. W.C. Wentworth, Historical Statistical, etc., op.cit., p. 98.


129. Rene Primevere Lesson in G. Mackaness, op.cit., p. 149.
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130. J. Atkinson, op.cit., pp. 62-3 gives a detailed assessment of the relative costs of different fodder for horse and bullock teams.

131. I. Badger's view, op.cit., p. 6, that owning and operating a saddle or harness horse was inexpensive is not supported by the evidence.

132. See Bean's view that the cheaper and faster rail services of the early twentieth century enabled itinerant rural labour to escape to their homes with their earnings. C.E.W. Bean, On the Wool Track, Sydney, 1969, pp. 106-10.


135. See the gradual loss of delight with outdoor slumber in E.M. Curr, James Hepburn, Alfred Joyce and George Russell's accounts of the early years of squatting.


137. This thesis affirms the validity of Fitzpatrick's view that the bicycle was an alternative to the horse rather than just a substitute. J. Fitzpatrick, The Bicycle and the Bush, MUP, 1980, pp. 10-11.


139. See the figures given by Robert Scott: Scott Family Papers, MS, 38/9, ML, Sydney.

140. See Macarthur Papers, Second Series, A4291, op.cit., for details of the expense of maintaining harness vehicles in working order on rural roads.

141. See Table 3.5.

142. For details of the costs, expenses and income returns from employing horses in pastoral work see the Scott Family Paper, loc.cit.

143. Man's interest in speed often becomes more important to him than many of the more rational and economic functions of transport. This was no less a factor in the early use of stage coaches. They were thrilling because they were fast. See the discussion of this in Anthony Bird, Roads and Vehicles, Arrow edition, London, 1973, pp. 5-6.


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146. Sydney Gazette, 25/1/1807. G. Dow, op.cit., p. 48, p. 99n4. Dow is a little too much of a champion of Terry in suggesting that his service was a fully established 'coach service'.


149. Sydney Gazette, 31 December, 1831.

150. A. Birch and D.S. Macmillan, The Sydney Scene, Melbourne 1962, pp. 8-9, consider this to be the first effective coaching service. This is open to dispute on the grounds that the vehicle does not appear to have been a coach and the route was probably not done in strict stages.

151. I. Badger, op.cit., p. 29; M. Stringer, op.cit., pp. 34-5; Hobart Gazette, 4/12/1819.


161. M. Stringer, op.cit., p. 11 and p. 44 gives details of the Ranken coach which employed both springs and braces which were better adapted to rougher road surfaces than the early heavy coaches.

162. Sydney Gazette, 31 December, 1831.

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165. *The Australian*, 20/1/1825, 14/12/1827.

166. See M. Stringer, *op.cit.*, pp. 36-7 for details of their plant. The values have been derived from costs of plant advertised in *The Australian* during the late 1820s.

167. Weekly wages for nine drivers, eight grooms and three ticket sellers/managers at one pound per week.


170. D.G. Boid, *op.cit.*, p. 65; in the late 1830s some roads were so bad that fares were more than doubled. *The Australian*, 23/7/1840.

171. New South Wales Parliamentary Acts: *An Act for the Regulation of Stage Carriages*, 6 Will. IV, August 1835. A similar Act was passed in Tasmania on 6 May 1836. All vehicles had to pass a licencing test and the number of passengers was limited to fifteen inside and twelve outside for large passenger coaches and five inside and nine outside for mail coaches. This was a considerable level of Government intervention but the simple vehicle registration regulations of 1813 were inadequate. See Government and General Orders: Respecting the Driving and Management of Carts, Cars and Wagons, 1813, MS D356-2, No. 9, ML, Sydney. The Stage Carriage Act was based on earlier English forms but provided far less strict controls over the numbers of passengers carried and the rates of fares. See A. Bird, *op.cit.*, pp. 108-11, for details of the 1832 Act which was used as the basis of the New South Wales Act.


174. See the comments on the speed and danger of travelling in mail carts by S. Stanger, 'A Journey from Sydney over the Blue Mountains to Bathurst Forty Years Ago' in G. Mackaness (ed.), *op.cit.*, p. 256.


176. Macarthur Papers, Second Collection, MS A4176, ML, Sydney.

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178. In the activities of the coaching companies in the 1850s the mail contract was still the essential basis of assured profitability. Passenger numbers rose dramatically but were not considered a reliable basis for operation. Cobb and Co. were amongst the most active seekers of mail contracts. See the details given in evidence in VPP (LC) Papers relating to Mail Contracts, 1852-53, Vol. 2 and The Report of the Commissioners appointed to enquire into the best mode of providing for the Internal Communication of the Colony, V. & P., 1854-55, Vol. 1.

179. Based on an expansion of the figures for Ireland and Richards and the known competitions. See also J. Raymond, op.cit., pp. 35-7.

180. The Australian Agricultural Company had stimulated an interest in these medium weight draught types from the second half of the 1820s. The Macarthur's bred them for farm and road work. Coaching provided a direct proof of their utility. See Macarthur Papers, Second Collection, A.A. Co. Horses 1827-29, MS A4328; Register of Horses 1828-35, A4225; Horses, A4237, ML, Sydney.


184. Ibid., pp. 37-45.

185. From the 1820s a number of important breeders like the Macarthurs and the Australian Agricultural Company specialized in the formation of medium draught horses of the Suffolk Punch and Cleveland Bay breeds. The earlier English and Flemish cart horses' offspring were also probably more widely available.


187. A number of business owners are recorded in the 1828 census as owning numbers of horses but without being significant landowners. It is assumed that these horses were used in business and for their own private transport. See Census of New South Wales, 1828, op.cit., Appendix 3, pp. 424-39.

188. I. Badger, op.cit., p. 37.


190. See Table 3.5.

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192. A detailed analysis of the application of draught types and vehicles can be found at Chapter 6, which gives a fuller account of the development of land-based transport, the forms of which remained fairly constant until the adoption of the motor vehicle in the twentieth century.

193. See Table 3.1: Horse and Cattle Ownership, New South Wales, 1828.

194. J. Atkinson, op.cit., p. 36.

195. Ibid.


197. See Section I of this Chapter and E. Dunsorfs, op.cit., p. 64; see also the evidence of Cox to Bigge quoted in C.J. King, op.cit., p. 525 and the report in the Sydney Gazette, 13/1/1819. Land cartage cost about six pence more a bushel than that of shipping but the greater security and control over sales for those who used drays normally more than offset this amount. See Oxley's Evidence to Bigge, in C.J. King, ibid., p. 605. In addition D.G. Bowd, op.cit., p. 29 makes the sensible comment that farmers down stream from the Windsor road were more inclined to use shipping to avoid the heavy work of getting their carts over the unmade tracks to the main Sydney road.

198. HRA 14, p. 132.

199. HRA 26, p. 342.

200. Bonwick Transcripts, Bigge Appendix, Evidence of Mr Allan, Box I, p. 508.


203. Macarthur Papers, Second Collection, Day Book 1823-1828, MS A4176 and Sales and Wages Book, MS A4186, ML, Sydney.

204. G.J. Abbott, The Pastoral Age: A Re-Examination, Melbourne, 1971, pp. 117-22 gives details of the costs of running a sheep holdings, all of which cite a bullock team and vehicle as part of the capital cost.


206. Macarthur Papers, Second Collection, Day Book 1823-1828, op.cit.; similar figures are given by a number of sources listed in G. Abbott, op.cit.


208. J. Atkinson, op.cit., p. 36; see also the Macarthur Papers, Second Collection, Horses-General Records, MS A4237, p. 25, ML, Sydney.
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211. Scott Family Papers, MS 38/9, ML, Sydney.

212. See Oxley's Evidence to Bigge, quoted in C.J. King, op.cit., p. 605.

213. HRA 26, p. 342.


218. M.B. Eldershaw, My Australia, London, 1951, p. 44.

219. See Table 4.2: A. Barnard, Visions and Profits, MUP, A.N.U., 1961, pp. 23-4, notes the gradual division of wool haulage between commercial and station teams on the basis of time and distance relations between the ports and the properties. L. Braden, Bullockies, First edition Rigby 1968, Seal Books, 1976, p. 7 is correct in affirming that bullock driving was an established occupation in 1828 but the inference that the contract teamster was operating in any numbers cannot be sustained.

220. See G.J. Abbott, The Pastoral Age A Re-Examination, Melbourne, 1971, Chapter 5, 'Sheep Farming: Costs and Returns' and especially p. 124 for the view that the sale of sheep was probably the most important common source of profit.


224. G. Caley, op.cit., p. 89; Caley was extremely critical of the tradesmen and, particularly, the wheelwrights, who were not able to use local timber. They used imported parts for wheels. It was an ironic criticism in that Caley, a skilled botanist, appeared to offer no advice on the most suitable local timber. It is easy to understand the tradition bound style of the tradesmen given their English background. See the account of strict tradition in the arts of a wheelwright in J.G. Jenkins, The English Farm Wagon: Origins and Structure, London, 1972, pp. 22-32 and pp. 61-80.
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225. See Table 3.5, Macarthur Papers, Second Collection, Sales and Wages Book 1820-30, op.cit.; See also the Scott Family Papers, MS 3879, ML, Sydney. On their Glendon property in a workforce of over sixty men, two blacksmiths, two grooms, two carters and five ploughmen were employed.


228. I. Badger, op.cit., p. 5.

229. In 1811 there was only one coachbuilding shop in Sydney run by George Cook, who offered to build or assemble chaises, gigs and carts, whereas in 1828 the firms of Charles Weaver and Anthony Horden had been added. The Horden works employed ten men and offered to build any type of vehicle. Sydney Gazette, 1810-1811 and N.S.W. Census of New South Wales 1828, op.cit., Appendix 3, p. 385.


231. HRA 11, p. 99; M. Stringer, op.cit., p. 98; G.P. Walsh, op.cit.

232. See New South Wales Colonial Secretary Returns of the Colony, 1820-30, for details of the cart, carriage and iron imports. The figures are expressed in money terms and packages and thus give little clear information as to the number of vehicles imported or the use of the metal imports.
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5. Ibid., p. 326.

6. The Australasian, 10/2/1900, p. 314.


8. The Australasian, 15/7/1893, p. 97; 18/8/1893, p. 227; G.L. Buxton, op.cit., p. 95; H. Cornish, Under the Southern Cross, 1880, Facsimile edition, Melbourne, 1975, p. 158; E.M. Curr, The Pure Saddle Horse, Melbourne, 1863, p xiv; C. MacAllister, Old Pioneering Days in the Sunny South, Sydney, 1903, pp. 152-6, records a number of the more spectacular rides: Bathurst to Sydney in twenty hours. Mudgee to Coolah, a distance of 144 miles, in 13.5 hours or a rate of 10.7 miles per hour; J.L. Thompson, 'Horses for the Indian and European Markets', AONSW, V. Oct. 1894, p. 722, records that a daily ride of over sixty miles was not considered uncommon.


13 Ibid., p. xvi and p. 1.


17. See Kiddle's affirmation of the view of Rolf Bolderwood; M. Kiddle, op.cit., p. 86.

18. The Australasian, 14/4/1894, p. 626 for details of the normal speeds of a saddle horse: speed at the walk: three miles per hour; 6.8 miles per hour at a trot; and fourteen miles per hour at a gallop. See APR, 15/5/1917, p. 450 and 16/4/1928 p. 347 for details of the many changes to the Australian jumping records.
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19. E.M. Curr, Recollections of Squatting in Victoria, First Published 1883, M.U.P. edition, 1965, p. 45; see also G.H. Hamilton, A Journey from Port Phillip to South Australia in 1839, Adelaide, 1880, pp. 15-8. Horses have a better sense of sight than of smell and although there are cases of them finding water in unknown areas their ability to find their way home has been shown to be the result of their having a good memory. See J.D. Carthy, Animal Navigation, London, 1963, p. 128; B. Grazimer, 'On the Psychology of Horses' in H. Friedrich (ed.), Man and Animals, London, 1972, p. 42.

20. See Chapter 7 Section III for details of the way breeding tended to an over supply of saddle horses. Chapter 8 provides details of how overseas market demand played such an important role in breeding approaches.


22. See details of the scientific trips mounted Wilson (1798), Barrallier (1802) and Calley (1805). HRA, 14, p. 940.

23. Consider the exploratory walks by Phillip, Batman, Grey, Collins and others in the first years of settlement in the respective colonies.

24. HRA, 10, p. 178 and 182.


27. Engels has shown that no matter how many horses are used they cannot carry their own food supplies for more than three to four days. Even if the rations of the men and the horses are reduced by half the extension of time is only marginally increased. See D.W. Engels, Alexander the Great and the Logistics of the Macedonian Army, University of California Press, Berkley, 1978, pp. 21-2 and p. 22n35, viz: These relationships can be expressed by the following formula:

\[ N = \frac{\text{d}(a+b+c)-(yz+200x)}{250-\text{d}(e+f+g)} \]

where \( N \) = the number of pack animals; \( a \) = the army's total ration of grain in lb.; \( b \) = the army's total ration of fodder in lb.; \( c \) = the army's total requirement of water in lb.; \( d \) = the number of days the provisions needed to be carried; \( e \) = a pack animal's ration of grain; \( f \) = a pack animal's ration of fodder; and \( g \) = a pack animal's ration of water. If the personnel could carry supplies, then \( y \) = the number of personnel; \( z \) = the average weight a person could carry. If the cavalry horses could carry supplies then \( x \) = the number of horses. When the personnel and cavalry horses can carry supplies, if the resulting number
above the division bar is negative, the carrying capacity of the personnel and cavalry horses will be greater than the amount of supplies needed to be carried, and therefore no pack animals will be required. It is doubtful, however, that cavalry horses were regularly used as pack animals since nothing will break their spirit faster than to be used in this way.

Engels has shown that it is impossible for any number of horses to carry their own fodder and water for more than three or four days. Different sizes do not help offset the carrying capacity/consumption rates. Even by reducing the rations of both men and animals to half rations the mileage is only marginally increased.


30. Ibid., p. 8 and Appendix II, pp. 189-90.


32. Ibid., p. 22.


34. The unsuitability of the heavy English pack-saddle had been commented upon by Evans. It was the reason why his party had to turn back from any extended exploration of the Bathurst Plains. See Evans’s account in C. Mackaness (ed.), Fourteen Journeys, etc.; op.cit., pp. 23 and 27.


37. Ibid., p. 18.

38. Ibid.


40. Ibid., pp. 60, 83, 88.

41. Ibid., p. 1 and 3.


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46. W. Bland, op.cit., pp. 25-6; C. Sturt, Vol. I, pp. 176-8; O. Ruhren, Bullock Teams: the Building of a Nation, Sydney, 1980, pp. 47-61 gives a misplaced emphasis to the role of bullocks in exploration at the expense of horses. It has been demonstrated here that one was dependent upon the other for overall success.


52. Ibid., pp. 213, 232.


54. T. Bergin, In the Steps of Burke and Wills, Sydney, 1981, pp. 118-9. Bergin re-enacted the expedition of Burke using camels during the winter of 1977. Landells also gave Burke faulty information on the speed of camels.

55. Ibid.


58. Ibid.

59. H.M. Barker, Camels and The Outback, Melbourne, 1964, pp. 77-8, 157-8, 207-8. See also the discussion in the Technical Appendix of this thesis.

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66. Letter of Major Mitchell to his son Roderick, 12/3/1846, MS A293-2, pp. 103-6, ML, Sydney.
70. H.M. Barker, Droving Days, Melbourne, 1973, p. 43.
72. The term overlander has been the subject of debate. One of the first uses of the term was to describe men taking livestock overland from New South Wales to the Port Phillip District. See A.S. Kenyon, 'The Overlanders', VHM, Vol. X, 1924-5, pp. 138-9. Two groups eventually qualified as overlanders: those who took stock of their own or on account for sale in a distant market, and those who took stock from a settled area to a new district to establish a pastoral holding. See the note by H.W. Haygarth, Recollections of Bush Life in Australia, London, 1864. Haygarth combines both groups in the term overlander as does Kenyon, ibid., p. 140. See C.W. Browne considers the first group to be the forerunners of the drovers the latter being squatters or settlers. C.W. Browne, Overlanding in Australia, Melbourne, 1868, p. 1. The settler-overlanders, thus, include all those who moved stock to establish new pastoral holdings. There were thousands of epic trips some covering huge distances like that of the Durack family who overlanded from New South Wales to the Kimberley district in northern Western Australia. See M. Durack, Kings in Grass Castles, First published 1959, Lloyd O'Neil edition, Melbourne, 1974. See also the fictional account which was used for the story of the film of the overlanders. D. Birtles, The Overlanders, Sydney, 1946. See also J.Collier, The Pastoral Age in Australia, Melbourne, 1911, p. 192, G.N. Griffiths, Southern Homes of New South Wales, Sydney, 1952, pp. 6-8.
73. See the full discussion of Droving at Chapter 5.
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76. The Australian, 5 May 1827.

77. H.R. Carter, The Upper Mooki, Quirindi, N.S.W., 1974, p. 10.


81. T.F. Bride, op.cit., p. 66. See also the details of the experiences of the Docker and Bates families in Journal of Mary Docker on an Overland Journey from Botany Bay to Port Phillip in 1838, MS, SLV, Melbourne. Bates Papers, MS H788, pp. 4-6, Box 111/2, SLV, Melbourne.

82. For most early stations a profit of fifty pounds in the first few years was considered a success. See details of a fairly typical range of expenses in C.D. Hodgson, Reminiscences of Australia etc, London, 1846, pp. 68-9.


84. H.H. Finlayson, op.cit., p. 111.

85. See G. Russell, CCP. Russell developed a swivel peg which enabled his horse to avoid becoming tangled by the tether rope.


87. P.L. Brown (ed.), The Narrative of George Russell of Golphill, O.U.P., London, 1935, pp. 82-6. Russell at first was forced to scout for a station on foot due to the shortage of horses. He brought his own on the second visit from Van Diemen's Land and resurveyed the Leigh River valley near Geelong on horseback before finally selecting the area for occupation.

88. See Statistical Appendix H.


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93. See Statistical Appendix H.


95. CCP, op.cit., Vol. II, pp. 55-6. The three mile rule meant that the nearest head station had to be at least three miles from that of your neighbour.


97. This whole paragraph is supported by pastoralists' records. For three good accounts see the recollections of the hardship of this work for horse and man in A. Joyce, A Homestead History, op.cit., p. 80; Quinlan, op.cit., p. 139; and Russell in CCP, Vol. II, p. 56.

98. A. Joyce, ibid., pp. 81-3; for details of selecting a run see pp. 102-4. See also E.M. Curr, Recollections of Squatting in Victoria, MUP, Reprint 1965, pp. 26-7.

99. P.L. Brown, op.cit., p. 188.

100. CCP, Vol. IV, p. 481.


102. Ibid., p. 245.


104. Ibid., p. 5.


106. Ibid., p. 214.


112. For perhaps the most extreme form of stating the case for Aboriginal resistance see F. Robinson and B. York, op.cit., passim, whereas M.F. Christie, op.cit., gives a more detailed view his account tends to be a single minded account of the extent of Black resistance to White settlement. Similarly Reynolds and Loos have extended the thesis of Black resistance and have attempted to quantify the extent of casualties on both sides. H. Reynolds, op.cit., and N. Loos, op.cit.


114. Ibid., passim.

115. N.B. Tindale, ibid., pp. 57, 66-7, 80; see also H. Reynolds, op.cit., 'The land, the explorers and the Aborigines', pp. 215 and 217.


117. W. Hatfield, op.cit., p. 17.

118. See K. Willey, op.cit., pp. 52-3, gives details of the Australia-wide occurrence of the view that the Europeans were the spirits of dead relatives. This almost certainly inhibited, in the short-run at least, Aborigines being more ready to resist the Europeans.


120. The Pinjarra battle began with two whites moving on foot being wounded by blacks. It was in response to this that the mounted party charged and in doing so killed five blacks.


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125. **Ibid.**, p. 144.

126. For the vital role played by the horsemen in battles see Hemming pp. 155, 157-8, 161-5, 194-5, 197-8, 203-4, 218-9, 244 and 276. See also Prescott, *op.cit.*, pp. 262, 264, 275-6, Vol. II, pp. 185, 247 and 247n.


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144. J.O. Randell, op.cit., pp. 45-6. This sort of report is found in most accounts of settler clashes with the Aboriginals. R. Milliss, op.cit., p. 67. See also Report of the Native Police, op.cit., p. 29, Q. 9; E. Morrison, op.cit., pp. 21-4.

145. This is based on several years' experience as an Australian Army training officer.

146. J. Hemming, op.cit., p. 195. Bolas were three stones tied to lengths of lamas' tendons which, when thrown, tangled around the horse's legs bringing it down.

147. H. Reynolds, Race Relations, op.cit., p. 27. In 1874 in the Pine Creek district fifty horses were speared; R. Milliss, op.cit., p. 40, 176n; R.J. Webb, op.cit., p. 9.


149. N.A. Loos, ibid., p. 62, quotes the complaint of the Queensland Police Commissioner in 1868 who noted that the drought and lack of fodder had halted his police patrols against the Aborigines.

150. Perhaps one of the first to trust Aboriginals with a horse was Mitchell who had a native guide ride a horse in his surveying work. See also details in H. Reynolds, op.cit., pp. 5-6; T.F. Bride, op.cit., p. 20.
CHAPTER 5.


2. P. Mathias and M.M. Postan (eds.). The Cambridge Economic History of Europe, CUP, 1977, Vol. 5, pp. 232-40. In Britain the droving of many types of animals from Wales and Scotland was carried on from the fifteenth to the middle of the nineteenth century. London's Smithfield market was the terminus for cattle, sheep, horses, ponies, pigs and many types of birds all of which walked to or were driven to this market. See C. Skeel, 'The cattle trade between Wales and England from the 15th to the 19th centuries', Transactions of the Royal Historical Society, Fourth Series, Vol. 9, 1926, pp. 135-58; See also B.H. Slicher Van Bath, The Agrarian History of Western Europe, AD 500-1850, Edward Arnold, London, 1966, p. 286. In western and eastern Europe stock were produced beyond the grain zones and were driven to fattening areas close to the towns and cities, then slaughtered for urban use. It has been estimated that the trade in cattle was second only to that in corn. Ibid.


5. Ibid., pp. 23-4, 38, pp. 43-4 and 92.

6. Ibid., pp. 65 and 90.

7. Ibid., p. 48; See also C. Skeel, op.cit., pp. 55-8.


12. H.M. Barker, ibid., p. 16; For fuller details of the early overlanders of this type and the settler type see A.S. Kenyon, "The Overlanders", VHM, Vol. 10, 1924-5, pp. 138-158 and pp. 173-207.


15. H.M. Barker, op.cit., p. 17.

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18. K. Willey, The Drovers, Macmillian, Melbourne, 1982, pp. 27-8. The contract drover group was divided by C.W. Browne into two types: the hired drover who was normally an ex-station stockman, overseer or superintendent and the ordinary working class stockman who had a good reputation and who was particularly skilled with horses and livestock. See C.W. Browne, Overlanding in Australia, Melbourne, 1868, pp. 36-7.


24. H.M. Barker, op.cit., pp. 19 and 20; See also K. Willey, op.cit., p. 18.

25. See N. Bartley, Australian Pioneers and Reminiscences 1849-1894, Brisbane, 1896, Reprinted Sydney, 1978, p. 197 for details of droving plant in the 1870s and 1880s; See also APR, 15/1/1892, p. 432; K. Willey, op.cit., p. 13 gives general figures for long distance trips with cattle; For details of the importance of dogs see APR, 15/6/1906, p. 305.


32. J.H. Hamilton, Narung MS 10261, Box 107/5, SLV.

33. Sorensen, op.cit., pp. 167-8, records that 600 of a herd of 860 bullock died on a trip to Hungerford in 1899. He also notes that poison weeds could kill large numbers of stock and gives an example of a drover losing 700 bullocks near Dundullimal in New South Wales in 1899; APR, 15/1/1892, p. 437-8 notes the very severe drought of 1876 in New South Wales in
which a drover took five months to cover only 300 miles and this effort cost him the lives of forty of his forty-two horses, however, he saved 900 out of the total of 1100 bullocks.

34. H.M. Barker, op.cit., p. 93.
35. C.W. Browne, op.cit., pp. 54-5.
38. W.L. Morton, op.cit., pp. 209-210. If stock move with their mates and camp with them at night herds are unlikely to stampede but mixed up and confused herds are often disturbed and set off by bullocks moving through the herd looking for their mates. See also H.M. Barker, op.cit., pp. 60-61.
40. H.M. Barker, op.cit., p. 98.
43. See E.M. Curr, Pure-Saddle Horse; H.M. Barker, op.cit., pp. 103-4; and for a fairly uncritical discussion of the origins and qualities of the Australian stockhorse see M. Durack op.cit., pp. 189-95.
44. M. Durack, ibid., pp. 201-6.
46. M.M. Bennett, Christison of Lammermoor, quoted in H.M. Barker, op.cit., p. 49.
50. See the provisions of the Public Water Places Act.
This map provides local details of all minor and major stock routes in New South Wales and the connecting railway stations. Private copy and ANU Archives of Business and Labour; See APR, 16/8/1918, p. 209 for details of the provision of water points on Queensland routes.


53. Australian Agricultural Company Papers WCP-A(7), 1/258, ANU Archives, Canberra; H.M. Barker, op.cit., p. 58; C.W. Browne, op.cit., pp. 72-74, who notes that loss rates of up to three percent of a herd were allowed. G.L. Buxton, The Riverina 1861-1891, MUP, 1967, p. 43 notes that, in 1860, a fee of one and one half pence per mile was charged for sheep. See also Kallara Station Records, 15/7, ANU Archives, Canberra, for details of droving fees for cattle which were charged at a daily rate of twenty-five shillings per head, rather than on mileage.


55. The use of stock routes as free grazing areas during bad seasons caused great bitterness and anger. For details of this see The Petition on Travelling Stock, in QPP, LA, 1868-9, and also in NPP, LA, 1870, Vol. 2, Report of the Chief Inspector of Stock for 1868, p. 5; See J.W. Power, "Travelling Stock", AJV, Vol. 5, 1907, pp. 734-5. Power lists the following as the main abuses: dealers who ran their cattle on stock routes; roadside grazing by small farmers; graziers who would turn large herds onto stock routes during bad seasons; drovers who were paid to move herds at their slowest pace on stock routes. Nevertheless there has been a very long and strong tradition in rural Australia that public lands and roads were the "long pastures" where free grazing could be obtained. The drover had to find the best route and the best fodder to ensure the highest payment for the job. To be forced to buy dry fodder to keep the stock in condition normally removed any margin of profit.


59. There were widespread complaints from pastoralists in Queensland, New South Wales and South Australia against the reduction of stock routes and reserves. The drive for more farm land faced opposition from pastoralists who were producing and moving greater numbers of stock. See the article "Inland Highways-Travelling Stock Reserves", in APR, 15/10/1907, pp. 703-705, and see the later debate in APR, 16/11/1920, p. 840. The Great Drought of 1895 to 1902 was normally sufficient reference to win most arguments about the importance of stock routes.

60. APR, 15/10/1907, p. 704; 16/11/1920, p. 840; and 16/11/1923, p. 967 for details of the acute shortage of railway trucks during periods of
drought. See APR, 16/11/1921, p. 859 for details of low prices and high freight costs.

61. APR, 16/7/1928, pp. 655-6 carries a fairly full account of the Report of the Federal Pastoral Advisory Committee. The committee also suggested that light gauge lateral lines be built to service larger areas.


63. B. H. Fletcher, Colonial Australia Before 1850, Melbourne, 1967, pp. 167-8 notes that there were probably 6,000 stockmen and 15,000 shepherds in the late 1840s. There are no adequate census data on drovers but this estimate has been made on the basis of contemporary reports and some simple calculations based on the numbers of stock moved. See the figures below.

64. APR, 15/9/1891, p. 240.


66. An account of the Durack trip is given in Dame Mary Durack, Kings in Grass Castles, London, 1967; A list of the most successful drovers in this period is given in APR, 15/3/1906, pp. 39-41.


68. APR, 16/9/1930, p. 895.

69. Sydney Morning Herald, 30/7/1856.

70. N. Bartley, op.cit., p. 183.

71. See APR, 15/6/1905, pp. 254-5 for details of these movements.

72. APR, 15/9/1906, p. 575.

73. APR, 15/10/1907, p. 704, and 16/7/1929, p. 653.

74. APR, 15/5/1911, p. 279.
CHAPTER 6


3. For details of the importance of horses in the British economy and transport system see: F. M. L. Thompson "Victorian England: The Horsedrawn Society", Inaugural Lecture, Bedford College, University of London, 22 Oct. 1970.; G. L. Turnbull Traffic and Transport: An Economic History of Pickfords, London, 1979. For details of the importance of horse, bullock, donkey and camel teams in long distance haulage in Australia from the 1890s until the 1920-30 period see H. M. Barker Camels and the Outback, Melbourne, 1964.; T. L. McKnight The Camel in Australia, MUP, 1969, pp. 72-6 and p. 82. McKnight notes that camel haulage probably reached its peak in 1920 but replacement by motor vehicles was not complete until 1940. The relative merits of camel and donkey draught power are not discussed in this chapter because a detailed analysis of their role in Australian transport to 1890 is beyond the scope of this thesis. A survey of the importance of the camel has been made at Technical Appendix VI.: Terrain and Claimate: The Use of Camels in Australia.

4. See Technical Appendix I: Speed or Power: The Resolution of Draught Power in Horses and Bullocks. Bullocks and horses produce a surplus greater than human labour power and a surplus greater than they consume. They were adopted some five thousand years ago to do the heavy work of agriculture and transport and have made a contribution to the growth of civilisation which has never been adequately assessed. J Bronowski The Ascent of Man, London, Paper Edition, 1976, p. 79.

5. For a detailed account of the resolution of draught power in bullocks and horses see Technical Appendix I, op.cit.,

6. See also Major-General, Sir F. Smith. "The Relationship between the Weight of a Horse and its Weight Carrying Power" Journal of Comparative Pathology and Therapeutics 11, 1898, pp. 287-290, and "Maximum Muscular Effort of the Horse", Journal of Physiology, 19, 1896, pp. 224-226. Smith notes that with poor harness horses were preferred as pack animals being able to carry more than they could pull. Improved harness, vehicle design and roads provided greater scope for the more efficient utilisation of draught power.

APR, 16 June 1923, p. 491 for a report of the dynamometer tests
conducted by horses by the United States Department of Agriculture.

8. M. Thorpe-Clark op.cit., C J Singer (ed.) A History of Technology,
Vol.2, OUP, 1968, p. 148. See also Technical Appendix II.: Harness for
Horses and Bullocks in Heavy Vehicle Haulage, and Appendix III: Bullock
Team Technology and Management.

9. B. H. Slicher Van Bath The Agrarian History of Western Europe, London,

10. S. Lilley Men, Machines and History, N.Y., 1966, p. 19 and pp. 49-50; T.
K. Derry and T. I. Williams A Short History of Technology from the

11. Scott Papers, MSS, Mitchell Library, Sydney; See CCP, passim, for
Russell's use of horses and the expense of shoeing; C. Chenevix-Trench
A History of Horsemanship, NY, 1970, p. 299. The images created by
stories like "The Man From Snowy River" ignore the fact that the wild
horses without shoes can only sustain gallops for short periods. When
captured and used in regular work they have to be shod.; See also
Chapters 4 and 5 for details of the importance of horse shoeing in
exploration and droving.

shoeing oxen had been in use from Roman times. Cattle driven from
Scotland and Wales to the London, later Smithfield, market were shod by
blacksmiths along the route. In England the words cues, kews or guss
were used, in Wales clws and in Scotland cues. The word cue was adopted
in Australia.

13. K. J. Bonser ibid., pp. 62-3; H. M. Barker Camels and the Outback,
Melbourne, 1964, op.cit., pp. 131-2; L Braden op.cit., p. 50; O. Rühen,
op. cit., p. 211; See also APR, 16 Sept. 1912. p. 706 for a picture
showing a bullock in a cueing pen being prepared for work on "metalled"
roads in New South Wales.

14. W. Bland (ed.) Journey of Discovery to Port Phillip, New South Wales, in
1824 and 1825, etc., Sydney, 1837, pp. 26, 84.

15. J. O. Randell (ed.) A. F. Mollison's: An Overland Diary, April-December
1837, etc, Melbourne, 1980. Calculated from data in the diary pp. 1-
62. Rest days have been excluded from the total to give working days.

16. T. and D. Learmonth Station Diary 1839-43, MS, H15788, Box 102/9,
Manuscript Collection, La Trobe Library, Melbourne.

17. Examples of the time and cost of straying animals can be found at: E. M.
Curr Recollections of Squatting in Victoria, MUP, 1965, p. 67; G F James
(ed.) A Homestead History, Melbourne, 1942, p. 62; Hamilton Papers,
Narung Station Records, 1859, MS, 10261, Box 107/5, Manuscript
Collection, La Trobe Library, Melbourne.

18. William Greig Farm Day Book, MS, Manuscript Collection, La Trobe
Library, Melbourne.


22. O. Ruhen op.cit., p. 201; Alan Marshall "The Mellow Note of the Bullock Bell". Walkabout Magazine, October 1950, pp. 12-14. Marshall claims that a good bell could be heard at seven miles and that claims were made for ten miles!


24. W. Howitt Land, Labour and Gold, London, 1972, p. 174; D. Harris Teams of the Blacksoil Plains, Camberwell, Victoria, 1977, p. 3.; L Braden op.cit., pp. 55, 59, 109. C. E. W. Bean On the Wool Track Reprint, Sydney, 1969. p. 86 notes that the task of bringing in the team was given to the "offside" or one who was learning to drive a team. He walked on the offside of the team. The term became a common description of any rural assistant.

25. L. Braden op.cit., pp. 41-2, Early eight hour day supporters!


32. F. E. Huggett The Land Question, London, 1975, p. 40. Huggett discusses the slow change to horses which by the nineteenth century had become common in Britain and Western Europe but in the drier southern areas oxen remained in use because there was insufficient summer fodder to support horses. See also L. White Medieval Technology and Social Change, Oxford, 1962, pp. 72-73 and B. H. Slicher Van Bath op.cit., p. 296ff.


36. J. Atkinson An Account of the State of Agriculture and Grazing in New South Wales, London, 1826, pp. 34-5. Four bullocks were slightly more powerful than two draught horses.

37. H. Widowson op.cit., p. 183.

38. See Table 6.1; J. Atkinson op.cit., p. 35 and D Harris op.cit., p. 2.

39. D. Harris ibid., pp. 2-4, passim.


41. L. Braden op.cit., p. 93.


44. D. W. Engles op.cit., p. 15 and n15; See also M. M. Postan op.cit., pp. 142-4 for a higher estimate that one horse was capable of the work of three bullocks. This seems a little too high.

45. See Table 6.1: Price Range of Vehicles and Draught Animals, 1820-1900.


47. See note 49 and 57.


49. Horses became the main power unit on small farms. A single horse could be used with a range of implements and vehicles and control of the animal was greater than with yoked bullocks. The expansion of smaller farms increased the demand for draught horses which was met by breeders and the unit cost fell steadily over the period. Horses, although requiring more fodder and labour in grooming and harnessing than bullocks, were capable of faster work and the income from horses was greater than that for bullocks. The greater prestige, which was in part based on these factors and snobbery also encouraged the wider adoption of horses. See also J A Perkins "The Ox, the Horse and English Farming, 1750-1850", Working Papers in Economic History, 3/1978, University of New South Wales, pp. 4-9. For an account of the change from oxen to horses in Britain which follows the same reasons as the Australian experience.

51. SMH, 9 April 1858.

52. G. F. James op.cit., p. 176 and 178; See also the comments of Archer and Hayter in Statistical Registers of Victoria 1860-1890.


54. SMH, 26 July 1890, 3 and 6 Sept. 1890.

55. McCullough Papers, Box 33, Telegram Orders 1870-80; See also the Warehouse Books for details of the thousands of tons of fodder carried as freight. Manuscript Collection, La Trobe Library, Melbourne.

56. O. Ruhen op. cit., p. 189.

57. See Technical Appendix VI; T. L. McKnight and op. cit., pp. 43-61, 71-80, 81-89. In certain arid areas in the western divisions of New South Wales and Queensland and in parts of South and Western Australia donkeys, but more especially, camels were used in preference to horses and bullocks until they too were replaced by motor vehicles in the 1930s.

58. C. E. W. Bean op. cit., p. 129.


60. Glen Hall loc.cit., passim.

61. The steepest gradient on the Mount York incline was reduced to one in fifteen in 1832 but except for dry weather this slope still required double teams. M B Eldershaw The Life and Times of Captain John Piper, Sydney, 1973, p. 186.

62. See Technical Appendix VII: Regulating Road Users: Taxes on Narrow Tyred Vehicles for details of the attempts to regulate the width of vehicle tyres.


66. O. Ruhen op.cit., p. 104.

67. G. Bennett Wandering in New South Wales, London, 1834, Volume 1, p. 238. Permanent water became the site of teamster's camps and from these hundreds of Australian towns grew at the junction of routes or at river crossing point. Notable examples include Albury-Wodonga, Hay, Deniliquin, Echuca, Quirindi and Tamworth. See R. Millis The Wallabadah
Manuscript, Sydney, 1980, p. 59, p. 191n for details of the evolution of the latter two towns from teamsters' camps.

68. R. Millis Ibid., p. 70.


70. See J. C. Foley Droughts in Australia, Bulletin No. 43, Commonwealth Bureau of Meteorology, 1957; J. V. Lovett (ed.) The Environmental, Economic and Social Significance of Drought, Melbourne, 1973, especially Chapter 2, "Drought Perception" and Chapter 10, "Physiological factors influencing the survival of animals during drought."


72. R. Milliss op. cit., p. 70.

73. R. Milliss Ibid., p. 19.


75. Hobart Gazette, 20/7/1816.

76. W. Howitt op. cit., pp. 54-5 and pp. 163-4.

77. D. Harris op. cit., p. 9; O Ruhen op. cit., p. 68.


80. L. Braden op. cit., p. 93; See also D. Harris op. cit., p. 4, who stresses the danger of working bullocks and horses in wet weather when yokes and harness caused chafing and the possibility of infection and loss of an animal.

81. L. Braden op. cit., p. 93, D Harris op. cit., p. 28.

82. L. Braden op. cit., p. 47. This pattern in addition to the normal north-south pattern of haulage contributed to the spread of pleuropneumonia from Victoria to Queensland.


88. Ibid.

89. For important contribution to the revised view see W. Albert The Turnpike Road System in England 1663-1840, CUP, 1972; E. Pawson Transport and Economy: The Turnpike Roads of Eighteenth Century Britain, London, 1977. Albert has shown that the turnpike system was beset by many financial, administrative and technical problems, but that the overall improvement in roads did provide a basis for the increased demand in the movement of goods, people and materials. Pawson has a more optimistic view of road development, he argues that there was a strong growth in demand for carriage expressed in a rising volume of road traffic which created the pressure for the turnpike system, which in turn improved roads.

90. G. L. Turnbull op. cit., p. 2, Turnbull points out that if the road system was as the traditionalists have claimed it to be, firms like Pickfords could not have operated as indeed they did.

91. HRA, 14, pp. 72-3.

92. Ibid., pp. 70-1. The added justifications that road building was suitable work for convicts and that tolls would pay for the upkeep of the roads appears to have mollified the authorities.

93. See the discussion in Chapter 3.

94. See Technical Appendix V: The Operational Capacity and Limitations of Heavy Drays and Wagons.

95. See Section VIII, for a discussion of the long run costs of haulage.

96. M. Kiddle op. cit., p. 266.

97. G. N. Blainey A Tyranny of Distance, Melbourne, 1966, see especially Chapter 6: 'The Land Barrier'.
98. Ibid., pp. 289-91; See also The Rise of Broken Hill, op.cit., pp. 22-5, for details of the importance of draught transport in the arid regions of Australia.

99. See Henry Selkirk "David Lennox, the Bridge Builder and his work", RAHS, Vol.6, Pt.5, 1920, pp. 201-43.

100. Major T. L. Mitchell Report upon the Progress made in Roads and Public Works in New South Wales, 1827-1855, Sydney, 1856, MS, ML.


103. Ibid., p. v.


110. Ibid., p. 206.

111. Ibid., See also NPP, LA V&P, 1865, Vol.2, Report on Subordinate Roads, for details of the classification system. Included in this system were the Metropolitan, the "Great Roads", Subordinate roads and eight road Trusts. The road trusts were concerned with only 2,000 miles of road in 1883.


114. NPP, LA V&P, 1869, Vol.2, Report from the Select Committee on Railway Extension, 1869, Minutes of Evidence, Q245 and Q258.

116. VPP, LC V&P, 1853-4, Returns of Expenditure by the Central Roads Board for 1853.


118. L. L. Banfield Green Pastures and Gold, Mullaya, Victoria, 1974, pp. 148-50. In the years 1864-6 the residents of the Ararat district counted the advance in their roads in terms of thirty-two bridges that had been completed, the road work was considered less important.


120. In the case of the Seymour punt fees fell from eighteen pence per horse to three pence and from one pound to three shillings for a dray and team. Similar reductions occurred at other punts and bridges. H. G. Martindale op.cit., p. 42.; See also VPP, LA V&P, 1859-60, Vol. 2, Returns of Tolls, 1860.


125. The Parliamentary papers of the eastern colonies between 1860 and the 1870s contain hundreds of petitions from residents of various towns pleading for bridges over local streams and rivers. The use of the word bridges in the reports on roads testifies to the importance of bridge building. For many people the building of bridges was more important than the work on roads.


133. R. J. Best Introduction to South Australia, MUP, 1958, p. 252.; Hirst notes that it was only the support from the central government that enabled local roads to be significantly improved. J. B. Hirst Adelaide and the Country 1870-1917, MUP, 1873, pp. 129-32.


136. SMH, 10/3/1860.


138. It is difficult to estimate the importance of the communication system in the co-ordination of thousands of men, the teams and steamers involved in the network. The surviving papers of McCulloch and Co. provide ample evidence of the thousands of messages involved in the organisation. See McCulloch Papers, In and Out Telegrams, MSS, Manuscript Collection, La Trobe Library, Melbourne.; See also A. H. Morris "Echuca and The River Murray", HS, Vol.4, No.16, 1951, p. 346. Co-ordination was never perfect and there were delays in shearing, the arrival of teams with stores or wool, breakdowns and accidents with boats and problems with floods or droughts to tax the skills of all those involved with the transport system. Morris ibid., pp. 349-50.


141. For details of the changes and increased number of haulage patterns see the records of carriage of the following stations in the ANU Archives: Goldsborough Mort's Ghalta Station, near Wilcannia, 2/306; Elsinora
Station, north west of Bourke, 2/306/2; Liewah Station, north of Swan Hill, 2/306/2; and Tickalara Station north west of Wilcannia, 2/306/2. Wool was carried by bullock and horse teams to the nearest river landing and then by steamer via the river to connect with coastal steamers for Melbourne.

142. R. H. T. Smith Transport and Commodity Movements in Southern New South Wales, Unpublished Ph.D Thesis, ANU, 1961, pp. 15-7.; See also A. G. Price's view that the South Australian government deliberated for twenty years on how to dominate the river trade. The Echuca line took the initiative out of their hands. Schemes like the Goolwa to Port Elliot railway helped South Australian shippers but the railway line from Kapunda to North-West Bend, in 1878, was a case of too little too late. A. G. Price Founders and Pioneers of South Australia, Second Impression, Adelaide, 1978, pp. 233-5.


146. A. Allen "Frontier Towns in Western Queensland Their Growth and Present Tributary Areas" in M. Barlow (ed.) Readings from the Australian Geographer, Sydney, 1975, p. 21. The new cost structure for food, supplies and the transport of wool played an important part in the change from cattle to sheep grazing in the south central and western divisions. Cattle had been able to transport themselves to market, but from the 1860s the river steamers were important in making wool production viable.

147. The first pressure that saw the greater use of camels was the combination of poor seasons and the spread of pleuro-pneumonia in the western division. See A. Allen op.cit., and Technical Appendix VI: Terrain and Climate: The Use of Camels in Australia.


149. See Smith's assessment of the results of road expenditure on improving bridges, culverts and roads which enabled teams to operate more efficiently during the 1860s and 1870s. R H T Smith op.cit., pp. 127-8.


23ff. The next phase of railway construction, from the late 1880's was concerned with building developmental lines aimed at increasing closer settlement and intensive agriculture in the interior. This phase, which ran until the 1920s, had a significant impact on the development of the area of cereal growing from South Australia, through the dry farming areas of Victoria and New South Wales and into Queensland. An important result of this later development was the ability of regional producers to supply the larger towns and cities with the vast quantity of animal fodder during the age (1860-1920) of horse powered towns and cities. Although this period is of relevance to the study of draught usage in terms of scope and space it has been reserved for treatment outside this thesis. For details of the history and impact of the developmental railways see: G. Lewis op.cit., pp. 274-5., J. P. Fogarty Railways and the Development of Victoria, 1860-1900., Unpublished Ph.D. Thesis, University of Melbourne, 1973, pp. 17-8, 416-7., also R. H. T. Smith op.cit., pp. 21-9, 95-6.

152. Commission of Internal Communications, ibid., and p. 78. However, Cobb and Co. were strong supporters of plank roads and argued that they were used extensively in America.


154. Report, op.cit., Appendix K, p. 98. An investigation in New South Wales arrived at similar findings and emphasised that while road haulage with horses was essential as feeders for rail, which would dominate long distance haulage, tramways were not assured of greater usage and profitability than road haulage. It was noted that road haulers would be able to compete with tramways and due to their greater flexibility they were likely to undermine the tramway operations. NPP, LA V&P, 1869, Vol.2, Report of the Select Committee on Railway Extensions, Minutes of Evidence, Q68-74. The distinct advantages of railways were capacity and speed. ibid., Q278.

155. Sir W. T. Denison Roads and Railways in New South Wales and India, Madras, 1864, pp. 43-46. Denison argued that for mineral work and even in areas of lower traffic levels horse tramways were viable alternatives to railways. He challenged the figures offered to the New South Wales Committee on Railway Extension. He argued that while railways were cheaper to operate they were the most expensive form to construct and were difficult to resite. Horse tramways were capable of efficient operation over distances of up to ninety miles and they could be built and operated at a cost comparable to railways. But his main concern was that tramways were more efficient users of horse power than roads. A horse on a road could haul about seven tons per week, on wooden rails the rate rose to forty-five and on metal rails the rate was one hundred and twenty tons. His lesson for developing the colonies was that more miles of tramways could be established and operated for the same expenditure on rail. ibid., p. 23, pp. 44-5.


Narrow Gauge, The Lal Lal Iron Tramway, and the general treatment of Victorian tramways in Tall Timber and Tramlines. The history of nineteenth century mining in eastern Australia is not complete without mention of the thousands of horses who worked above and beneath the ground. Unfortunately it is beyond the scope of this thesis to treat them in detail.


159. VPP, LA V&P, 1869, Vol. 2, DIO, Report from the Select Committee on Railway Extension, 1869, pp. 111 and pv.; NPP, LA V&P, 1870, Vol.2, Report from the Select Committee on Railway Extension, p. 3. The Echuca line was profitable but the 27,000 tons of freight each year was far below expectations, while in New South Wales the steep gradients on the Southern lines limited trains to less than 150 tons.


163. M. Dunstan Willunga: Town and District, Lynton, South Australia, 1978, p. 42; See also the pictures of horses employed in railway building at p. 46; L. Braden op.cit., p. 30.

164. See note 202 for details of the growth in draught haulage in response to railway development.


168. See comments on the diseconomies of scale of the Table Top in L. Braden loc.cit.

169. See Technical Appendix IV: The Development of Australian Draught Powered Vehicles, and H. M. Barker op.cit., pp. 43-44.

on the spread of pleuro-pneumonia to New South Wales and Queensland
during the 1860's. Moving from the first infection in Melbourne in 1858
the disease was spread by working bullocks and travelling stock moving
north and it eventually reached the Northern Territory by the late
1870's. The heavy loss of working bullocks during the 1860's and 1870's
was a strong incentive for teamsters to use draught horse teams instead
of bullocks. NFP, LA V & P, 1867-8, Vol.4, pp. 71-88, Report on Pleuro-
Pneumonia by the Chief Inspector of Sheep and Cattle.

171. L. Blake Covered Wagons, op.cit., pp. 48-51.; Interviews with K. C. and
K. Hofmaier, Beulah, Victoria, April 1977.

172. See details of road haulage to Goonoo Goonoo Station in Pell River and
Mineral Company, Series 169/19, ANU Archives, Canberra; C. E. W. Bean
op. cit., p. 129; G. N. Blainey, Our Side of the Country, Melbourne,
1984, pp. 60-2.

173. Mel. Davies 'Bullocks and Rail - The South Australian Mining Association

174. M. Davies Ibid., p. 150-65.; G. N. Blainey Tyranny of Distance, op.cit.,
pp. 123-5.; See also Barnard's similar comments on the restrictions of
transport costs. A. Barnard The Australian Wool Market, 1840-1900,

175. M. Davies op.cit., p. 163.

176. Clarence and Richmond Examiner, 16/6/ 1888.; See also 'J. M. E.'
'Historical Roads of New South Wales: The Story of the Gwydir Highway',
A History of the Northern Tablelands of New South Wales 1818-1900, SUP,
1966, pp. 120-2.


178. W. S. Logan 'The Decline of Victoria's Southwestern Outports 1890-1900,

179. Ibid., pp. 32-44.


183. APR, 15/5/1894, p. 111.

184. J. P. Fogarty op.cit., p. 96.

186. APR, 14/4/1900, p. 74.

186. C. Daley 'The Oldest Road in Gippsland', VHM, Vol.6, No.4, 1918, p. 180.
D. Harris op.cit., p. 12 discusses the alternative routes that were
taken to Louth, Hay or Bourke with copper from the Cobar mines.

188. R. Milliss *op. cit.*, p. 190n.


201. L. Banfield *op. cit.*, pp. 152-3. See also H. G. Martindale, *op. cit.*, p. 84, who notes the stimulation the railway brought to production in the Shire. Transport flowed to the station at Seymour rather than passing through the town.


204. APR, 15/5/ 1894, p. 111.; See A. Allen *op. cit.*, for a discussion of the rates offered by the Queensland railways.


206. J. P. Fogarty *op. cit.*, pp. 98ff.


210. M. Davies _op.cit._, p. 163.

211. For a detailed discussion of the tractive power of railways which are superior to those of draught transport see R. W. L. McKay 'Railway Motive Power and its Influence on the Railways Place in Australian Development', _Journal of the Australian Institute of Engineers_, No. 29, 1957, pp. 89-90.

212. See Table 6.5: Freight Rates To Goonoo Goonoo Station, 1857-66. See also the subsequent Tables 6.6 to 6.10.

213. M. Davies _op.cit._, p. 163.

214. G. N. Blainey _op.cit._, pp. 123-5.; See the lengthy discussion of costs, profits and milage based on Blainey's example in M. Davis _op.cit._, pp. 150, 161-3.

215. See Chapter 3.


219. M. Davies _op.cit._, p. 163.

220. J. P. Fogarty _op.cit._, pp. 95-6.; See also the figures given in Table 6.6: Team and Railway Freight Rates, Victoria, 1840-1890.

221. J. P. Fogarty _op.cit._, p. 97.

222. G. Hall, _op. cit._, pp. 22-4.

223. A. Bruce Report on Pleuro-Pneumonia, _op.cit._, See also Chapter 7: Australian Horse Breeding.
FOOTNOTES: CHAPTER 7.

1. Most of the literature on horse breeding in Australia discusses race horses, the most complete histories are found in D. M. Barrie *The Australian Bloodhorse*, Sydney, 1956, and *Turf Cavalcade*, Sydney, 1960. Two major works on working horses are K. M. Dallas *Horse Power*, Hobart, 1968, which examines the role of draught and harness horses in the history of Tasmania and E. M. Curr *Pure Saddle-Horses*, Melbourne, 1863, who discusses the role played by the saddle horse in the settlement and pastoral development of Australia. Curr makes a plea for the strict revision of breeding techniques and the use of proven methods of obtaining well-bred horses.

2. Table 2.3 at Chapter 2 gives details of the number and types of horses imported during this period and shows the mortality figures for each shipment.

3. See Chapters 2 and 3 for a fuller discussion of this point.


6. ibid., p.11.


8. For details of the Australian horse stock see *Statistical Appendix H: The Australian Horse Population, 1788-1928*, and Chapter 2 Table 2.3: *Imports of Horses to New South Wales, 1788-1830*. This latter table provides full details of the numbers, breeds and origins of imported horses.

It has been assumed that about half of all live foalings were female foals and that mortality was roughly the same for male and female foals. Statistical information is from: Table 2.3, op.cit.; and Appendix C: The Number of Horses in New South Wales, 1788-1830.

D. Ballantine The Horse in Australia, Melbourne, 1976, p.15;

D. M. Barrie Turf Cavalcade, op.cit., p.2; and Table 2.3, Chapter 2.

See Statistical Appendix C.


See Marsden's boast that his Arab horses were of such quality that he "...saw few superior when in England". In G. Mackaness (ed.) Some Private Correspondence of the Reverend Samuel Marsden and Family 1794-1824, Sydney, 1942, p.43; see also the comments on Captain Piper's Arab stallions and horses in M. B. Eldershaw The Life and Times of Captain John Piper, Sydney, 1973, pp.46 and 114.

See P. Smith op.cit., pp.24-5; and Table 2.3, Chapter 2.

J. T. Bigge [3] p.32; HRA, III, 4, p.82; S. M. Onslow op.cit., p.323; M. B. Eldershaw op.cit., p.49; G. W. Evans A. Geographical, Historical and Topographical Description of Van Diemen's Land, London, 1822, pp.55-6. Some attempts had been made to get draught horses or horses suitable for draught work from cross-breeding larger framed animals, but as Atkinson noted the results were a number of 'nag' types little suited to draught or saddle work. The very few draught and cart horses that arrived by the 1820s were highly prized and prices at one hundred pounds each. J. Atkinson op.cit., pp.60-1.

Anon., 'First Blood Horses of the Colony' New South Wales Sporting Magazine, No.1, Vol.1, 1848, pp.18-26; See also E. M. Curr Pure Saddle Horse, Melbourne, 1863, p. 130ff.

See Sir J. Lackey History of Horses and Horse-breeding in New South Wales, Sydney, 1873, pp.10-11; D. M. Barrie op.cit., pp.2-3; see also Table 2.3, for statistical details of imports.
20. J. W. Evans (et.al.) The Horse, San Francisco, 1977, pp.524-50. This section provides a detailed treatment of the most recent applications of genetic knowledge to the breeding of horses.

21. Modern horse breeding based on these sources of information and skilled selection can now hope to generally avoid the production of unsound and unsuitable stock. ibid., pp.549-59.

22. A. Bruce AGNSW, Vol.XII, 1901, pp.1563ff, passim.

23. J. Atkinson op.cit., pp.60-1. True to type: meaning that the original stock are sufficiently pure-bred to repeatedly reproduce pure-bred stock.


31. HRA, III, 2, pp.291, 295.


34. D. Ballantine op.cit., p.15.


37. ibid., p.88.


A. Bruce *ibid*.

See *Statistical Appendix H.*, for full details.

See the regulations of 1811 and 1820 for New South Wales and the 1820 regulations for Van Diemen’s Land in *HRNSW*, 7, pp. 582-3; *HRA*, III, 3, pp. 281 and 314; and the 1830 Impounding Act : 4 William IV, No. 3, in *HRA*, 27, p. 270. The impounding Act was adopted in all of the Australian colonies with similarly severe penalties. See also C.L. Pannam *The Horse and the Law*, Law Book Co., Melbourne, 1979, especially "Liability for Injury and Damage Caused by Horses" at Chapter 6 for a full account of the developments in the laws relating to horses causing damage or trespassing.

See A. A. Company: Peel River Company Records on Wild Horses.

New Zealand was an important buyer and supplier of horses but in the numbers given the horses imported from New Zealand have been excluded since it is impossible to determine the number of horses that were imported for racing or breeding purposes.

E. H. Edwards (ed.) *A Standard Guide to Horse and Pony Breeds*, Macmillan, London, 1980, p. 8. the first pony was imported in 1803 and this was followed by representatives of most of the British pony breeds including Shetland, Dartmoor, Exmoor, Highland, New Forest and Welsh ponies. In addition significant numbers of Hungarian and Timor ponies were imported, especially the latter. The inter-breeding of these
breeds led to the formation of the Australian pony which was recognised as a distinct breed in 1920. In 1929 the Australian Pony Stud Book was begun with the aim of promoting high quality ponies for light harness work and as good riding mounts for children. The Australian pony most closely resembles the Welsh Mountain pony which contributed, perhaps most of the pony's blood line. Ponies have played a significant role in children's transport and recreation but have been excluded from the tables and discussion of horse breeding in this Chapter. They will be treated in a separate article.

48. See HRA, HRNSW, Returns of the Colony, and Statistical Registers, 1860 to 1920. An exception was 200 Clydesdale horses imported during 1930-5; this was a response by Australian farmers to a rapid rise in the costs of mechanical farming and Scottish breeders attempts to clear their stock. See also E. B. Comans in W.J. Beckett (ed.) The Australian Blue Book, Sydney, 1948, p.597.

49. See Statistical Registers of Tasmania, 1850-1920, although exact numbers cannot be determined the repeated imports of horses with average values two and three times the market average suggest that these were stud horses. Similar entries are found in the Statistical Registers of Queensland from 1861.

50. New South Wales produced an annual average output of over 417,000 horses from 1850 to 1920: Calculated from data at Statistical Appendix H.

51. See Statistical Appendix H.


53. See the Macarthur Papers, A4225 Horse Register 1828-35, A4236 The Stud Book, which contains the record of Alice Grey, a mare which gave twelve healthy foals in twelve years of breeding, MS, ML, Sydney; Scott Family Papers, MS 38/9, ML, Sydney.

54. New South Wales Official Year Book 1922, p.627 and 1930, p.260. The early droughts appear to have stimulated rapid replacement of horse stocks, as was the case after the 1901-2 drought but there was never a sustained recovery in the horse numbers after the 1919-20 drought.
The Statistical Registers provide limited details of the breeds and sex of imported horses, however, additional information comes from the sources cited below.

Australian Agricultural Company Dispatches 1828, 78/1/4, folio 483, pp.14-5; 78/1/6, folio 145, ANU Archives, Canberra.

See A. A. Co. Dispatches 1834, 78/1/14, folio 63 for details of Captain Collins’ purchase of twenty horses shipped to India in 1834; and Dispatches 1842, pp.121-2 for details of the colonial demand for Cleveland breeding stock, 78/1/16, ANU Archives, Canberra.


See P. G. King’s comments on imports during the 1830s in A. A. Co. Dispatches, 1/2/1841, p.657-60, ANU Archives, Canberra; See also P. Smith op.cit., pp.24-5 who notes that at least fifteen Arab stallions were imported between 1830 and 1839. For details on the Dangar studs see: The Australian Encyclopaedia, op.cit., pp.550-1, The Australian Dictionary of Biography, Vol.1. pp.280-1. Hereafter ADB.


Kater Papers, MS, AK 36/1, ML, Sydney. Sir Hercules’ skeleton is preserved in the Sydney science museum and provides that city’s answer to Pharlap!


See the observations by P.G. King in A. A. Co. Dispatches, 18/7/1842, pp.236-7; see also D. G. Bowd Macquarie Country, Sydney, 1979, p.192.
See the estimates based on the figures given in the Reports of the Chief Inspector of Stock; See also A. A. Co. Dispatches 1834, 78/1/14, folio 63; 1833-8, 78/1/15, folio 39; Macarthur Papers, Horse Register 1828-35, MS A4225, ML Sydney.


Macarthur Papers, MSS A4238, 4240 and 4244, batches of horses were overland to Melbourne for sale during the 1850s. ML Sydney.


E. M. Curr op.cit., p.182.

A.A. Co. Dispatches 1863, 78/1/36, pp.55 and 102.

Macarthur Papers, Horse Sales by J. and W. Macarthur, A4238-42, Entries for 1860-70.

These figures are estimates based on a range of data including the figures by T. A. Coghlan developed from the 1880s. These are developed below. See also Sir John Lackey History of Horses and Horse Breeding in New South Wales, Sydney, 1873, p.10.

Australasian, 7/8/1869, p.185; 14/8/1869, p.216; see also the A. A. Co. Dispatches 18/9/1861, 78/1/34, p.295 for details of the extent of the problem caused by wild horses in destroying breeding controls in most of the pastoral districts.

NFP V & P (LA), 1871, Report of the Chief Inspector of Stock 1870, pp.4-6; Australasian, 7 and 14/8/1869.

See Table 7.2; P. Smith op.cit., pp.24-6.

D. M. Barrie op.cit., p.452, The exhibitors were as follows: G. Campbell, Duntroon; W. Rutledge, Molonglo; Mr Bell, Muswellbrook; Mr Reynolds, Tocal; Mr Dines, Singleton; Mr Hetherington, Morpeth; Mr Busby, Cassills; Mr Wyndham, Bukkulla; Mr White, Upper Hunter, Mr Cheeke and Mr Tait, Sydney.

See Table 7.2, figures for imports from America.

See the evidence and discussion in APR, 15/8/1895, p.337ff.

APR, 14/1/1893, p.1028.


82. See the F. B. S. Falkiner Papers, MSS, 107/8 Stud Service Book 1893-1913; 107/20 Horse Book: Mares 1890-1922; 107/9 The Percheron Stud Book 1924-40, ANU Archives, Canberra; APR, 16/5/1915, p.523; ADB, Vol.4, pp.150-1; E. B. Comans op.cit., p.597. See also D. Harris The Teams of the Black Soil Plains, Camberwell, 1977, p.XI for a picture of a fourteen Percheron horse team working on Falkiner's Boonoke station.


84. For details of the growth of cereal production and draught employment see E. Dunsorof The Australian Wheat-Growing Industry 1788-1948, MUP, 1956, pp.532-3; APR, 15/4/1912, p.201.

85. APR, 16/10/1911, p.891. Bawdysey Volunteer was imported in 1911 by A. A. Dangar of New South Wales.

86. See APR, 16/7/1904, p.335-7, 15/9/1902, p.453, 15/11/1913, p.1138.

87. APR, 16/7/1904, pp.335-7.

88. Sydney Stock and Station Journal, 9/6/1911, p.5; APR, 15/12/1910, p.1172, 15/2/1911, p.1399; 15/10/1912, p.861.

89. For full details of the horse numbers see Statistical Appendix H.


92. APR, Victorian Notes 1895-1920, See also Table 7.11.

93. See Table 7.0 and Statistical Appendix L.

94. CPP, op.cit., Vol.II, p.287; Learmonth Records, MSS, H15788, Box 102/9, SLV, Melbourne; CPP, Vol.III, p.163; M. Kiddle, op.cit., pp.381-2; see also CPP, Vol.II, p.287 which records that Fisher and Russell had each others stallions serve their mares.

95. Port Phillip Herald, 28/8/1840, p.4.
96. Port Phillip Herald, 9/6/1840, p.2; Port Phillip Gazette, 15/5/1841, p.3.

97. Port Phillip Gazette, 22/11/1845, p.3.


101. Port Phillip Herald, 7/8/1840, p.4; 14/8/1840, p.3.


107. The Statistical Registers of the colonies provide totally contradictory figures for imports and exports between the colonies and it is impossible to determine the net transfers between each colony.


111. See the reports in The Argus, 1840-50 of Kirk’s stallion parades which give a clear indication of the range and popularity of each breed.

112. See details of these studs in The Yeoman and Australian Acclimatiser, 27/2/1864, p.350. See also E. M. Curr The Pure Saddle-Horse, op.cit., for details on the decline in saddle horse standards during the 1850s in Victoria.

113. See Statistical Appendix H.
Town and Country Journal, August 1877.

Australasian, 23 August 1873, pp.248-9, for Lackey's comments that Victoria had supplanted New South Wales as the major supplier and shipper of good quality remounts, See also D. M. Barrie The Australian Bloodhorse, p.452; E. B. Comans op.cit., p.596 and Chapter 8 of this Thesis.

See Chapter 6 for details of how railway extensions increased the demand for horse-powered haulage.

Australasian, 3/1/1874, p.24, See also the evidence given in QPP, Report of the Royal Commission on the Improvement of Horse Stock, op.cit., pp.20-2; QPP, ibid., p.20, see also the Table 7.6; E. Dunsorfs op.cit., pp.150-1.

Australasian, 13/2/1886, p.299; E. B. Comans op.cit., p.596.

See the earlier discussion on horse breeding in New South Wales.


See details of time, speed, etc., in B. Lubbeck The Colonial Clippers, Glasgow, 1948, pp.242-3, and 259. See also the details of direct shipment in Australasian, 13 February 1886, p.279 and for details of individual horses see the shipping reports Australasian 1880-1890.

APR, 15/2/1897, p.604. See Chapter 8, Horse Exports.


Pure-bred Clydesdales grew long hair or a 'feather' on their lower leg and this became bound up with mud during the ploughing and planting seasons. Cross-breds without the 'feather' required far less time in grooming.

Australasian, 7 August 1897, p.272.

See Table 7.4 for details.


Australasian, 7/8/1897, p.272.


131. Stock and Station Journal, 28/2/1913, p.11.

132. Scottish Clydesdale Stud book was begun in 1878. APR, 15/2/1905, p.994.


135. AJV, Vol.II, 1903-4, p.866. See also Statistical Appendix H.

136. Ibid., Statistical Appendix H., In the treatment of each colony's horse stock ponies have been included as part of the horse population. Most of the imported ponies were of British or European breeds. No detailed discussion has been made of ponies since they are considered to be beyond the scope of this thesis.

137. HRA,III, 6, pp.124-5.

138. Clyde Company Papers, Vol.2, pp.45 and 70. (Hereafter CPP.);
See also M. Bassett The Hentys: An Australian Colonial Tapestry, MUP, 1955, pp.42, 322, 439.

139. See K. M. Dallas Horse Power, Hobart, 1968, pp.4, 17ff, passim, for a discussion of the qualities and breeds of Tasmanian horses.

140. Ibid.


142. See P. R. Gordon "The Heavy Draught Horse of the Future" APR, 15/2/1905, p.965, who notes that Tasmanian draughts, pure bred Clydesdales or cross-bred Clydesdales and Cleveland Bay horses, were considered the best road horses in haulage to the goldfields.

143. These figures have been calculated from the Statistical Registers. The average export value for the period 1850 to 1909 was seventy pounds.

144. D. Ballantine op.cit., p.17; APR, 15/3/1900, p.7.


146. J. Collier The Pastoral Age in Australia, Melbourne, 1911, p.262.

149. E. B. Commans op.cit., p.595
151. Ibid., Q 1304-9.
152. E. B. Commans op.cit
154. Ibid.
155. K. M. Dallas op.cit.
156. See Statistical Registers of Tasmania.
157. See Statistical Registers of Tasmania, 1900-1920. Over the period 1840 to 1919 Tasmania imported 10,727 horses compared with exports of 20,046 giving net exports of almost 10,000 horses valued at least at 700,000 pounds.
159. Ibid.
164. See Statistical Appendix H.
165. See the evidence of high quality South Australian saddle horses in APR, 15/3/1900. p.7; See also Statistical Appendix K.
166. APR, 16/8/1903, p.485, 15/6/1905, pp.256-7 and p.327.
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2. Ibid., 15/12/1816.
3. Ibid., 3/5/1817.
5. D.M. Barrie, ibid.; E.M. Curr and other writers have all stressed that the policy of importing high quality bloodstock had produced quality colonial horses.
11. There are no accurate records of the numbers shipped by Riley, Campbell and others nor are there exact records of the value given to these horses as exports. There are virtually no records of the prices that were obtained on arrival at their destinations.
14. W.A. Brodribb, Recollections of an Australian Squatter, Sydney, 1883, pp. 4-14, passim.
17. Ibid., pp. 29, 127.
18. Ibid., p. 122.
20. Ibid., p. 650.
22. Ibid., p. 654.
23. Ibid., p. 654.

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24. Act 4, Wm IV, No. 3, Section 18. This Act was passed in New South Wales in 1830 and applied to the Queensland and Port Phillip Districts as well. Similar Acts were subsequently passed in all the colonies. Section 28 of the Act justifies the erection of pounds and the reason why the gelding of colts became common: '... great injury has arisen to the breed of horses and horned cattle by reason of entire horses and bulls of inferior kinds being allowed to stray and run loose.' Given the penalties imposed it was safer to geld entire colts and young bulls. The Act is quoted in full in W. Kerr, Melbourne Almanac and Port Phillip Directory, Melbourne 1841, p. 85ff.

25. The flying horse symbol used by an international oil company in Asia and the Middle East always exhibits a stallion with a large sheath and scrota. When the Vacuum Oil Company used this sign in the Middle East during the 1930s without the sexual appendages their sales of petrol almost ceased as the Arabs stated that such a symbol represented 'a product that was of no real value or power. Many members of the Indian army refused to ride geldings since such animals cast a reflection on their courage and manhood.

26. Ibid., pp. 654-7, 651.

27. Ibid., pp 651-3.


29. See Table 8.1: Horse Exports to Overseas Markets, 1816 to 1860.

30. See Table 8.3: Australian Horse Exports, 1816 to 1860 for details of the gross export figures for each colony. That is the recorded totals of all horses exported from the colonies taken from the Statistical Registers.

31. The total of horses exported from the various colonies shown in Table 8.1 and that shown for foreign sales in Table 8.2 reveal a difference of almost 2,500 while the figures for the value of horse exports are almost the same. It is felt that the value figures are probably slightly understated but given the system of record keeping they show a reasonable similarity. The difference in the totals for the numbers exported reflects the greater concern for recording values rather than numbers at this time. The higher total of 12,819 probably more accurately represents the numbers exported.

32. See Table 8.1.

33. APR, 15/6/1893, p. 206.


35. Sydney Kidman's operations in both these areas typified this pattern of production. See I.L. Idriss, The Cattle King, Discovery Press, Penrith, N.S.W., 1973. In addition farmers and pastoralists in the closer settled districts near Adelaide produced larger numbers of horses for local use.
and for the export market. See Reports of the Department of Agriculture in South Australian Journal of Agriculture, 1890-1900.


37. See the transcript of the interview with Mrs Murray-Smith who provided extensive details of Mr Margrett who was a major horse shipper. MSS in the author's possession.

38. APR, 16/10/1929, p. 923.

39. See Table 8.3.


42. APR, 15/9/1892, p. 731.

43. APR, 15/1/1897, p. 547, AGNSW, Vol. XI, 1900, p. 496, APR, 16/10/1915, p. 949.

44. APR, 15/1/1900, p. 632; 15/11/1906, p. 764.

45. APR, 16/10/1915, p. 949; 15/9/1923, p. 777.

46. APR, 16/5/1898, p. 150.

47. APR, 15/12/1897, p. 526; APR, 15/2/1900, pp. 719-20; AGNSW, Vol. XI, 1900, p. 459.

48. AGNSW, Vol. XI, 1900, p. 496.


50. APR, 15/5/1902, p. 142.


52. APR, 15/8/1913, p. 794.

53. APR, 15/12/1911, p. 1058; 15/10/1913, p. 954.


56. APR, 15/9/1923, p. 777. See also Table 8.3.

57. APR, 16/9/1929, p. 822.

58. APR, 16/10/1929, p. 923.
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60. Port Phillip Gazette, 22/2/1845, p. 3.


63. Ibid., pp. 27-31.; APR, 15/9/1891, p.257.; From Melbourne Mr. A. Currie's 2,000 ton horseboats carried 400 horses at a steady ten knots. Numbered amongst the new style horseboats were S.S. Bulimba, Virawa, Waronga, Bhundara and the Gulf of Venice.

64. E.M. Curr, 'Shipping Horses', The Economist, 1 Oct. 1869, p. 3.


67. Australasian, 31/7/1886, p. 204. The use of the 'horse-box' loading technique was also tried as an alternative to the sling. The horse was led into a wooden stall like box. This was then hoisted up and lowered onto the deck. The horse was then led to its stall. This was a much safer method than the sling and avoided cuts, bruising and abrasions commonly caused by an ill-adjusted sling. It was only marginally faster than the sling and required almost as much labour. APR, 15/2/1895, p. 616.

68. APR, 16/7/1900, p. 278.


70. APR, 16/12/1895, p. 547; and 15/2/1899, p. 638.


72. Ibid., and 22 Oct. 1869, p. 3.

73. APR, 16/12/1869, p. 545.

74. B. Lubbock, op.cit., p. 261.

75. APR, 16/12/1869, p. 545; Hayes, op.cit., pp. 9-10.

76. Ibid.


78. Indeed, the size, type of boards, fittings and equipment for each stall was set out in great detail by the remount authorities during the Boer War and World War One. See Captain M.H. Hayes, Shipping Horses, this book devotes a chapter to detail the specifications required by the military authorities.

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79. Ibid., p. 37ff.

80. Ibid., pp. 132-3; APR, 15/12/1906, p. 864.

81. APR, 16/12/1895, p. 545.

82. APR, 15/12/1906, p. 864.

83. APR, 16/7/1900, p. 278.

84. APR, 16/12/1895, p. 545; 15/12/1906, p. 864.

85. The Economist, 1 Oct. 1869, p. 3.


87. M.V. Hayes, ibid., APR, 16/12/1895, p. 546. The British military in shipping horses from Britain to South Africa cut the food to 22 lbs of oats, bran and hay per day.

88. M.V. Hayes, ibid., pp. 176-7; APR, 15/7/1895, p. 242, 16/12/1895, p. 546.

89. APR, 16/7/1900, p. 278.

90. APR, 16/7/1900, p. 278.

91. Australian, 5/3/1887, p. 442. In the period from the start of the Boer War in October 1899 to January 1900 some 10,000 tons of Australian hay had been sold in South Africa, APR, 15/1/1900, p. 632.

92. This data fits numerous shipping reports over the period. For post 1890 see the shipping notes in the APR. The Australasian, 6/8/1892, p. 248 gives details of 357 horses, including some high quality racing and carriage stock, sent to India. The 160 tons of fodder loaded is near perfect fit of this ration rate.

93. The Economist, 8 Oct. 1869, p. 3.

94. The Economist, 1 Oct. 1869, p. 5.

95. Australasian, 12/6/1886, p. 1116.

96. Australasian, 12/6/1886, p. 1116; evidence of E.W. Edwards who had extensive experience in shipping Clydesdales to and from New Zealand. The rail tying method, used extensively in sailing ships on the island routes, involved tying a rope around the horses' necks, with a bowline knot to prevent strangulation. The rope gave more freedom than a halter and enabled a horse to lie down in calm seas and more easily regain their feet in a storm. AGNSW, Vol. XIII, 1902, p. 452.

98. APR, 16/12/1895, p. 546.

99. Ibid., p. 546. See also E.M. Curr's observations The Economist, October 1869.

100. M.V. Hayes, op.cit., pp. 8-9. He also berated remount officers who failed to give horses adequate time to adjust to their new diet after landing. In some cases, particularly in the South African War, horses were disembarked and immediately sent on campaigns where they broke down or died.

101. APR, 16/12/1895, p. 546.

102. APR, 16/12/1895, p. 546.

103. B. Lubbock, op.cit., p. 215 and p. 261. The attempts to ship live cattle, sheep and horses to Britain during the 1890s collapsed. The stock had such high mortality rates and the survivors required several weeks to regain saleable condition at a cost that left no profits. Australasian, 19 Oct. 1895, p. 792; APR, 16/12/1895, p. 532. The greatest number of deaths on one voyage occurred before the ship reached Albany. APR, 15/10/1895, pp. 424-5.

104. APR, 16/12/1895, p. 533.

105. APR, 15/7/1901, p. 310.

106. APR, 15/2/1909, p. 1044.

107. Australasian, 31/7/1886, p. 204.

108. The Yeoman and Australian Acclimatiser, 16 Aug. 1862, p. 9; APR, 15/2/1899, p. 864.

109. APR, 15/12/1906, p. 864; 16/12/1929, p. 1168.

110. APR, 16/12/1895, p. 547.


112. APR, 16/12/1895, p. 547 and 15/6/1901, p. 310.

113. APR, 16/12/1895, p. 547.


115. APR, 16/12/1895, p. 533. Even with the danger of storms on this route, shipments were made without loss.

116. HRA, I., Vol. 18, p. 651; there were a few notable exceptions. The Macarthur brothers, Sir Rupert Clarke and others. See APR, 16/5/1898, p. 150 for details of Clarke's shipment. These were breeders who operated large scale studs and were thus able to make up full cargoes. The vast majority of horses were organised by buyers.
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118. Australasian, 23/12/1869, p. 535.

119. APR, 16/11/1929, p. 1051, the Director of Remounts of the Indian Army, Brigadier-General W.H. Anderson supervised the selection of 5,700 horses in 1929.

120. APR, 15/2/1905, p. 999, Messrs Morton and Marden, of Sydney, called for the supply of particular numbers and types of horses for a foreign contract. This was a fairly common feature of the trade over the whole period.

121. APR, 16/12/1929, p. 1168.

122. APR, 16/4/1928, p. 347; APR, 10/4/1909, p. 143. Obituary notices in the APR often record the fame and high regard with which many of the agents were held.

123. APR, 15/11/1900, p. 556 and APR, 15/1/1914, p. 36.

124. See details of the career of Mr Margrett who became one of Victoria's leading export buyers. He began with little capital or experience of horses to become a wealthy and an acknowledged expert in the horse export trade. Transcripts of the interview of Mrs Murray-Smith his daughter, 1980.


130. APR, 15/2/1909, p. 1068.

131. APR, 16/12/1895, p. 545-6.

132. APR, 15/12/1909, p. 1068.

133. Statistical Appendix I & J; APR, 15/7/1892, p. 731; 16/12/1895, p. 546.
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135. APR, 15/8/1896; 16/12/1929, p. 1168.


137. For a detailed break down of the sales in each market zone see Statistical Appendix K.

138. AGNSW, Vo. XIX, 1908, pp. 738-9. The serious epedimic horse diseases of Europe, Africa, Asia and America were prevented from entering Australia. The various colonial and later State governments gradually improved the protective barriers to prevent the importation of horses diseases. See Chapter 7: Australian Horse Breeding.


140. Ibid.

141. Ibid., p. 67. Note there were large numbers of Silladar regiments. The rider of the horse (Silladar) was paid to purchase and maintain his own horses.

142. HRA, I, Vol. 18, pp. 649-50; APR, 15/7/1892, p. 731; Heathcote, op.cit., p. 201.

143. R.L. Heathcote, p. 67 and 201.

144. APR, 15/9/1892, pp. 731-2.

145. The Economist, 22/10/1869, p. 3; APR, 16/12/1895, pp. 547-8.

146. APR, 15/2/1899, p. 638.


150. Australasian, 15/12/1894, p. 1085.


154. Indian Government Commission into the Failure of Horse and Mule Breeding in India for Military Purposes, quoted at length in AGNSW, Vol. XIII,
1903, pp. 1174-5 and pp. 1003-7. The most tragic irony of the commission's findings was that they repeated the main points reported by J.H.B. Hallen, General Superintendent of Horse Breeding, in 1884; see report in AGNSW, Vol. V, 1894, p. 720.

155. Ibid.


157. APR, 16/9/1907, p. 599; APR, 16/8/1919, p. 678. Increased numbers of brood mares and stallions were exported to India from 1901 to 1914 and again after the war.

158. Australasian, 9/6/1866, p. 313; The Economist, 22/10/1869, p. 7.

159. APR, 16/12/1895, pp. 546-7.

160. APR, 15/2/1899, p. 638.

161. APR, 16/5/1898, pp. 150-1; APR, 15/2/1899, p. 638. Moreover, the Australian laws on branding meant that many horses realised far less than they might. Indian purchasers disliked horses that had in any way been badly disfigured. Australasian, 31/3/1894. The Queensland Brands Act required a brand of two letters and one figure each of which was one and a half inches square. A horse that had been sold might carry two or three ugly brands. APR, 16/5/1898, p. 150.


163. APR, 15/8/1911, p. 679; APR, 15/1/1909, p. 1031 records the sale of the Thoroughbred stallion Peru to an Indian stud.


166. APR, 15/9/1892, p. 731, provides a break down of four-fifths military and one-fifth domestic. Given the fluctuations of the market and military rejections this ratio was probably closer to three-fifths and two-fifths.

167. APR, 15/8/1908, p. 540.


170. APR, 16/7/1904, p. 326.

171. APR, 15/8/1900, p. 400.

172. APR, 15/6/1901, p. 218.
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173. APR, 15/2/1911, p. 1399.

174. APR, 15/10/1908, p. 685.

175. The figures in the Statistical Registers suggest that there was a gradual increase in the number of race horses exported to the Straits Settlements, Hong Kong and Indonesia from 1900 and particularly after the First World War.

176. Ibid. This trend is confirmed by the State Statistical Registers.

177. APR, 16/2/1920, p. 180.


179. APR, 16/2/1922, p. 97.

180. APR, 16/6/1916, p. 584.

181. APR, 15/8/1900, p. 336. In addition an extensive shipment of several thousand tons of hay and oats were purchased in Melbourne for the German forces in China. It was also reported that the German authorities were so pleased with the performance of these horses in China that 500 were to be reshipped to Germany. German Agricultural Gazette quoted in APR, 15/7/1901, p. 309-10. Further interest in Australian stock was shown in 1913 when the Trakehnen Stud in Germany purchased two noted Australian race horses, Cadonia and Hymen for 2,000 and 1,750 guineas respectively. APR, 15/12/1913, p. 1238.

182. APR, 15/5/1907, p. 1077.


184. Australasian, 2/2/1869, p. 152; gives figures that suggest the breeder's profit on a horse sold in India might be as high as twenty pounds. But an accurate costing would reduce this to five pounds.

185. See Table 8.9.


187. Ibid.

188. APR, 15/3/18978, p. 35.

189. APR, 15/3/1897, pp. 6-7.


191. APR, 16/12/1895, p. 545.
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194. AGNSW, Vol. XII, 1901, p. 1427.

195. See the difference in Victoria and Queensland prices quoted in APR, 15/8/1900, p. 7; 18/5/1903, p. 159; 16/11/1904, p. 677; 16/1/1905, p. 841.


197. APR, 16/3/1931, p. 222.


204. APR, 15/8/1895, p. 337.


207. Australasian, 8/12/1900, p. 1240.


209. AGNSW, Vol. XIII, 1903, pp. 1074-6, G.S. Smith, Stock Inspector at Bathurst, lists the important changes to pastoral operations which by 1900-03 had reduced the scope of horse breeding.


211. Sydney Stock and Station Journal, 19/8/1910, p. 5, APR, 15/5/1913, pp. 508-9, APR, 16/2/1916, p. 135. Added to these difficulties was the relative shortage of brood mares - large numbers of which had been exported to India, Africa and the Far East. Sydney Stock and Station Journal, 13/3/1914, p. 5.


213. APR, 16/12/1929, pp. 1168-69.
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214. See Table 8.6 and 8.3 for market and state divisions. This figure includes some of the horses exported to the Boer War as part of the colonial contingents and those sent to the Sudan, but excludes 375 of the Victorian Boer War horses and all those exported for use by the First AIF.

215. The figure of an average of four pounds per horse is probably close given the peak war time prices for the sale of stud and racing stock.
TECHNICAL APPENDICES

I. Speed or Power: The Resolution of Draught Power in Horses and Bullocks.

II. Harness for Horses and Bullocks in Heavy Vehicle Haulage.

III. Bullock Team Technology and Management.

IV. The Development of Australian Draught Powered Vehicles.

V. The Operational Capacity and Limitations of Heavy Drays and Wagons.

VI. Terrain and Climate: The Use of Donkeys and Camels in Australia.

VII. Regulating Road Users.
The size and shape of a horse determines the weight borne by the fore and hind quarters. Since no two horses are exactly the same there can be no generalisation of the weight distribution of all horses. One of the most important factors in the distribution of weight is the length of the neck and the size of the head. The long necked Thoroughbred types tend to carry more weight on the fore limbs than the short necked medium draught and roadster types. The Thoroughbred horse has an average ratio of about 4:3 on the fore and hind legs. Heavy draughts have a similar distribution, while hacks and light draughts or cobs have a ratio of about 5:4. (Figure 1) The longer the body and the heavier the chest and belly the more the distribution approaches equality.

Figure 1: Points of the Horse.

The distribution of weight, the height and volume of the horse are important determinants of its centre of gravity. The lower the centre of gravity in any body the greater its stability and balance. Although the centre of gravity in moving animals is constantly moving, its location in particular breeds enables them to perform different tasks with greater efficiency. The exact position of the centre of gravity in a horse has probably never been determined. It can be reckoned to be at the intersection of the vertical line drawn just to the rear of the withers and brisket (the girth line) and the horizontal line, dividing the middle third from the lower third of the body. (Figure 2) Thus, a horse with long legs and neck and a slim body is less stable than the shorter legged deep body type. The more 'daylight' under a horse the higher his centre of gravity and the higher the proportion of weight on his fore feet.

Given that the longer the lever arm is from the fulcrum the smaller the force required to exert a unit of power, the longer the horse's legs the more efficient it is in forcing its body forward. When it trots, canters or gallops the movement of the legs causes a lateral displacement to the left and right. In the fastest gait this displacement increases the instability of the animal. The closer the horse's hooves trace out a straight line the smaller the lateral displacement and the greater the forward speed. Breeds which have fairly close set legs are better able to place their feet on a near perfect line and use less muscular energy in correction. In addition, the closer the fore and hind quarters are together the less power is lost in the resolution of the force applied by the legs to the ground. The horse's legs act as levers in forcing the body forward. The leg is extended to apply the force, pushing the body forward and the leg is then swung forward to a new position. Greater speed is gained by the fullest extension of the leg. In the gallop the maximum power is applied by the leg and the body is tilted
forward pushing the centre of gravity forward of its base support throwing the whole body forward at greatest speed, albeit at considerable levels of muscular output of energy. A light body weight and long thin muscle groups which act faster than short thick ones provide the final ingredients for speed. The Thoroughbred type, although it resembles a compact box on stilt-like legs with a long-broom like head, in fact, provides the best dynamic combination of centre of gravity instability, minimum lateral displacement, light body weight, compactness, and the best applied resolution of power from the four quarters. It is capable of very high speed over fairly short distances.

Figure 2: Centre of Gravity.

Source: M.H.Hayes Points of the Horse, p 52.
The Australian saddle horse which normally contained both Thoroughbred and Arab blood is normally less tall and somewhat heavier than the pure Thoroughbred. Adapted to local conditions it is capable of moderate speeds, but due to its less demanding action and energy output, it is able to maintain its speed for far longer periods without becoming winded or exhausted. Its greater ruggedness and strength enable it to carry out a wide range of tasks from rapid pursuit and sharp turning to sure footed jumping and smooth carriage over rough ground.

The draught horse is to applied traction power as the Thoroughbred is to speed. Draught in the collar or breast harness is an act of pushing rather than pulling. The action of pulling can only be said to occur when something is attached to the tail. In Norman times many farmers adopted the cruel practice of tying the implement (plough) to the horse's tail. This practice lasted for many centuries until being made illegal by an Act of Parliament in 1634.

Propulsion in draught is similar to normal locomotion in that it is the resolution of force and weight applied to the levers of the horse's body. In the hind quarters the movable point is where the thigh bone rests against the pelvis and in the fore quarters, the lower end of the humerus. When the horse is in harness the resultant centre of pressure and the movable point is the inner surface of the collar. In Figure 3 the propelling forces are shown by the lines AB and CD. The resultant force passes between AB and CD and probably approximates the line BC. To gain maximum power draught horses adopt a position in which their limbs are more closely at right angles to the line of the lever. The horse crouches down in the hind quarters and leans forward over his fore limbs. The fore legs take only short steps as the
rear "gather up" and the load is drawn. The resultant force along BC is the resolution of the forces applied by the series of levers which extend from the toe of the hind feet through the leg, pelvis and spine and similarly acts in an upward sloping direction against the collar. In addition to this force is the resolved force of the weight of the horse. By leaning forward to displace the centre of gravity the angle is increased and the weight of the horse acts along the line EF. The resultant of the forces along BC and EF provides the forward locomotion of the draught and its burden. A light cart horse can be assisted up a slope by his driver mounting his shoulders in the way that a lighter man with another on his shoulders can beat a heavier man at tug-of-war.

These two main features of draught propulsion enable us to make deductions about the best size, shape and employment of horses. A cart or wagon horse operating on smooth roads or surfaces will derive an advantage from having its body weight to the fore quarter, where it is more directly resolved on to the collar. (along EF in Figure 3) A two-wheeled cart should be designed so that some of its weight is directed forward on to the shoulders of the horse. The greater weight of heavy draughts will enable them to move more securely than a light horse on smooth or slippery surfaces. On undulating or ridged surfaces the added stability and power of greater body weight will be offset by the fatigue of the horse raising his own weight with higher steps. The draught horse ought to have a heavy neck and massive shoulders. He will be fairly long in the body relative to height and higher in the withers than the croup. Too low a rump, however, reduces the power from the hind quarters.
Figure 3: Resolution of Draught Power.

Source: M.H. Hayes op.cit., p.67.

Four major types can be seen as best suited to particular work. Heavy draughts, the Clydesdales and Shires, were best suited to heavy haulage. Suffolk Punch and half-bred Clydesdales were suited to work on arable land which required medium weight draught horses. Long distance, light to medium load haulage, over varying roads required a light to medium draught weight which gave less power but was offset by an action that reduced fatigue. The lower payload could be moved at higher speeds by light wagon or coaching types like the Cleveland Bay. Arab and Thoroughbred horses were found the best
suited to light harness and saddle work.

The application of draught power by bullocks was similar to that of horses in that they both push rather than pull their loads. Bullocks use a yoke to convert their effort into draught power rather than the collar worn by horses. The bullock's physical structure means that it cannot push against a collar with its chest as does a horse. The yoke is borne across the neck at the head of the shoulders of each of the bullocks forming a working pair. The yoke, in pairing bullocks provides greater stability, control and resolved draught power to the drag chain.

The relationship of the bullocks to the yoke, bows and chain is shown in Figure 4.

Figure 4: Application of Draught Power By Bullocks.

A: Resistance, B: Applied Draught, C: Resultant direction of draught power
The bow and the chain hold the yoke on the bullock's shoulders and the drag on the chain forces the bullocks to bend their necks and push up and forward against the yoke. The resolution of draught power by a pair of yoked bullocks is the force exerted at B which overcomes the resistance of the load A and is given as the resultant force directed along the drag chain at C.

Bullock draught is not as efficient as that of horses. Bullocks have to be worked in pairs and are less able physically to be harnessed to obtain all their power. Unless a pair is matched for size, strength and effort much of the draught effort may be lost. It is vital that both bullocks apply their effort equally to the yoke to give a straight pull otherwise, except when turning, draught power is lost. Greater weight and the conformation of a draught horse can give it increased draught power but, with bullocks, increased size is not resolved as part of the draught power. It does normally mean that the bullock is stronger and will be able to work harder.
Appendix II  Harness for Horses and Bullocks in Heavy Vehicle Haulage

Horse Harness

1. The diagram below shows the normal form of harness used with horses in hauling drays, carts or light wagons. In haulage using teams of horses wagons often had dual shafters using the same harness as shown here. The remainder of the team wore the same harness with the exception of the breeching gear and in some cases the cart saddle was not used.

Figure 5: Horse Harness for Haulage.

Source: K.M. Dallas Horse Power, Hobart, 1968, p.36
Bullock Harness

2. The basic form of harness used by bullock teams in Australia consisted of a curved yoke, the two bows and the 'start' or centre ring. Although various forms of horse harness were used in the early years of settlement the yoke and bows remained little changed over the whole period. The Australian yoke was very different from the European form which consisted of a straight pole and instead of iron bows, straight pieces of wood on either side of the neck were tied under the throat with greenhide rope. The Figure below shows the form of Australian bullock harness. The yoke (a) was shaped from four inch hard wood with a curve to fit the neck of each bullock. The bows (b) were made from one inch iron rod and held in place by the key (c) on the end of the inside arm of the bow. The 'start' or centre ring (d) which was to attached the 'drag' or hauling chain was held by a bolt passing through the centre of the yoke and held in position by an iron pin (e).

Figure 6: The Bullock Yokes.

Source: APR, 15 September 1911, p.744
A Modified Yoke.

3. The picture below shows a minor adaptation of the yoke dating from the 1900s. The bows have been bent forward to give less pressure on the bullocks' necks. This was not common during the nineteenth century.

Source: APR, 15 November 1911, p.65
Appendix III  Bullock Team Technology and Management

In Australia the term Bullock for cattle used in draught ignored the sex of the animal, although most working bullocks appear to have been gelded males. The English words oxen or working oxen were used in government records until the 1830s. Thereafter, bullock or working bullock became the conventional term used throughout Australia. Arthur Rippon, a famous teamster, made the following distinctions. Bullocks are more correctly called steers, (that is castrated male cattle) up to the age of two years, then to the age of six years they are bullocks and thereafter they are oxen. These distinctions were often made for fat cattle but for working cattle the term bullock was used from the time they were trained to the age of twelve or fifteen years, the normal end of their working lives. The driver of a team was called a bullocky or bullock driver. The term bull-puncher was used but it became more associated with droving or working as a stockman. The term bullock driver became the common form in census returns from the 1820s. Bullock driver, bullocky and teamster were interchangeable terms, although teamster was used to refer to both bullock and horse team users.

An evaluation of the advantages and limitations of the bullock team as a draught unit provides an explanation of why they were used in certain areas and not in others and why the horse dray and wagon gradually replaced the bullock team as the most common form of heavy haulage. The four basic types of vehicles and draught forms are illustrated in Figure 1. These are the general forms since in each case there were considerable degrees of modification in the size, the amount of iron work, the use of sides and in the types of timber used. Type A, the two-wheeled light cart or dray, pulled by a single bullock or horse harnessed in the shafts was one of the earliest and most widely used forms. It could be used to haul loads of up to one ton over relatively short distances. Various versions of this vehicle were used in
dozens of tasks on farms, the roads and in urban carrying and construction. Type B, the heavy two-wheeled dray or pole dray, became the main heavy haulage vehicle throughout eastern Australia for the greater part of the period from 1830 to the 1870s. It was normally hauled by bullocks in teams numbering four, eight, twelve or more. It could carry, depending upon the bulk of the cargo, from one to two and one half tones. This vehicle was the mainstay of the pastoral settlement and mineral development and was used for both short and long distance haulage.

Type C, the early four-wheeled wagon, came into use in the 1820s. It was hauled by both bullock and horse teams using from four to twelve animals. The location of the front wheels, outside the tray or box form, meant that it had a very limited arc of turn. The wheels could be easily locked in a turn and the vehicle overturned. Nevertheless, it remained in wide use in the second half of the century in the open plains of the central grasslands where rapid or acute turns were less important. Type D, the adapted four-wheeled wagon, gradually replaced the Type C wagon. The 'pony wheel' assembly placed under the tray made it easier to steer and more stable. This type of construction was used from about the 1840s and there were a number of distinctive varieties derived from the English or German pattern. The giant 'Table Top' wagons of the last 1880s period were adaptations from this type of wagon. Capable of carrying up to thirty tons they were generally employed over fairly short distances.\textsuperscript{5}
Figure 7: Vehicles and Draught Arrangements

Type A  The Two-Wheeled Light Cart or Dray

Type B  The Heavy Two-Wheeled Dray

Type C  The Early Four-Wheeled Wagon
Type D  The Adapted Four-Wheeled Wagon

Modified Type C used with Horse Teams

The formal shaft arrangement connected to the pony wheel assembly provided more direct control in turning. It was a basic feature of all wagons used in carrying wheat and fodder during the last decades of the nineteenth century.

Side View of Typical Bullock Dray Loaded with 2.5 Tons of Wool

The number of animals or draught power employed depended upon the load to be carried, the terrain and the distance. In short light haulage the cart or light dray was normally powered by a single horse or bullock called a shafter. If the load or the terrain demanded more power one or more animals were hitched in line in front of the shafter. The heavy dray and the wagon were hauled by a team made up of pairs, each of which performed specific functions. In the pole dray the first pair (1) were called 'polers'. It was their task to support the pole and assist in pulling it round in making turns. In the wagon with a swivelling or pony wheel assembly when horses were used the first pair were called 'wheelers!'. The second yoke of bullocks or pair of horses were called the 'clampers' (2) who played a vital role in directing the draught force down the pole when the team was turning corners. The third pair (3) were known as the 'body bullocks'. Additional pairs were added to provide the draught power required for a particular load or terrain. Most teamsters appear to have tried to have a small surplus of power for normal emergencies. This was provided by one or two pairs of animals and would not have been necessary on a hard and reasonably level surface. The front pair (4) were called 'leaders' in both bullock and horse teams, with 4a the nearside and 4b the offside animal. The leaders were the most valuable and highly trained animals in the team. In a large team of twenty bullocks the leaders were up to seventy or more feet from the turning point of the vehicle. At such a distance the successful operation of the vehicle and team depended upon their responsiveness to the driver's commands to slow, stop, proceed or turn to the left or right. It must be stressed that for large teams of ten or more animals reins were not used and the leaders, be they bullocks or horses, had to be trained to obey verbal commands.

The development and training of a good team might take several years and a teamster who began with a small team and a dray could graduate to a
large team using a wagon. In team haulage the pairs were chosen for their ability to perform their particular tasks. The polers were normally the largest and most powerful, since they carried the forward thrust of the load when going down hills and it was their task to hold the pole down to the line of draught in ascending hills; light-weight polers could be lifted off the ground on a steep ascent and strangle in their yokes. The clampers were chosen for their weight, strength and steadiness. The body bullocks were the less intelligent while the leaders were selected for their readiness to learn and respond to commands.  

The type of bullock selected had to have long legs, and a strong neck and be a good traveller. A large and powerful body was needed to give both weight and strength in draught. Good feet were the most important quality—the animal had to have hard and strong hooves and he had to stand up on his toes since flat footed bullocks like human beings, soon became foot sore. Each pair was matched for gait and size rather than appearance. Slight differences in size were less important than having a similar gait since it was the gait that determined if each did an equal share of the work in the yoke. 

The choice of breeds was a matter of great debate. J T Bigge noted, in 1820, that Cape and Bengal types crossed with European breeds provided the most hardy animals for draught and Widowson, in 1829, noted that the Bengal-cross cattle were able to do more work on poor fodder than the pure bred European cattle. As the European breeds became established the teamsters claimed different favourites, but a common theme was that cross-bred bullocks from Shorthorn, Durham, Hereford and other breeds gave the best workers. The second common element stressed by teamsters was that of size and strength. There was no place for a lazy or jibbing bullock.
The methods used to train a team or a replacement bullock do not appear to have changed during the nineteenth century. Some teamsters argued that bullocks had to be trained as pairs and that a single bullock could not be added to a team. This seems to have been a minority view based more on fancy than good sense since a new bullock soon became adopted by an experienced beast. The breaking in and basic training took about two weeks when a young bullock was yoked with a trained animal. The two animals were yoked together and their tails tied to prevent them turning around in the yoke and tipping it upside down. They were left for two or three days to become 'mates' and then to work in simple pulling tasks. After a week or two of working together the pair formed a bond and when a team was being yoked each of the 'mates' would line up in their correct places. The cost of having a bullock trained was normally ten shillings each plus two weeks rations for the trainer. This charge does not appear to have varied over the period. The cost was offset by the amount of work done as part of the training. The pairs used as leaders normally required several months training.13

Control of a Team and Draught Power

The basic control of a team of bullocks appeared quite simple to a spectator. The bullocks were yoked in pairs, the polers' yoke connected to the pole and the remaining pairs had their yokes connected to the drag chain. The driver gave the command 'get up' and the bullocks moved forward. A shout of 'whew!' or 'whoa back' and the leaders stopped bringing the rest of the team to a halt. If the command 'gee off' was given the team followed the leaders to the right or 'get over' turned them to the left.14
A. Resolved line of draught.

(a) Sub-lines of draught resolved through the yoke on to the ring and then through the drag chain in the direction of A.

B Counter pull. The pair pull either together or singly across the line of draught A. This reduces the total draught and increases the work of the remaining team.

C An individual bullock either not pulling or pulling in or off the line of draught quickly reduces the draught of the pair and adds an extra load to the rest of the team.

The reality of driving was far more complex than it appeared. The essential process teamsters relied upon was that of conditioned responses. Each animal had to have a distinctive and clear name to avoid confusion with another member of the team. Each bullock had to know his place in the team, his task and to respond to commands given with his name.
In the crudest sense the team can be considered to be made up of eight independent 'four-wheeled' engines tied in pairs to a chain on which they can swivel individually or as pairs. Effectively the team shown in Figure 2 can attempt to apply their draught power in eight different directions. Given this potential choice of directions it is not hard to understand George Russell's awe while watching a skilled teamster control his team without halters or reins.\textsuperscript{16} W.L. Morton was surprised to hear a teamster talking incessantly to his team and to see that bullocks understood everything he said 'I had previously regarded bullocks as stupid but no longer thought so'.\textsuperscript{17}

The larger teams of the 1870s and 1880s which totalled twenty-four or twenty-eight bullocks made the problem of control and maximising draught even more difficult. The main task of the teamster was to overcome the independent or incorrect lines of movement and pace of work by individual bullocks. To gain the maximum draught power each member of the team had to be operating at the appropriate angle and speed to complete the manoeuvre demanded.\textsuperscript{18} The control technique was a matter of conditioning each bullock to respond in the desired manner to a range of commands far more detailed than the basic four. Minor adjustments had to be made to the rate of work of each beast and that beast alone. In a large team this meant a continual flow of commands to control the twenty or more semi-independent power units.

**Steering a Team**

A skilled teamster could have his team and vehicle avoid or turn around a rock, tree, rut or gate post by a margin of an inch or two. But many an inexperienced driver found his vehicle jammed on these objects or leaving a trail of demolished gate posts in his wake. An analysis of the work done in turning a bullock team provides an appreciation of the many skills of the driver and his team. Steering a pole dray or a wagon involved having the
polers and the clammers pushing to the left or right. Using a dray this
required pivoting one wheel and speeding the other over the ground, without
firm control of the the team this movement failed and the dray was dragged
beyond the point of the turn. Alternatively, if the team cut into the turn
too acutely the dray would be tipped over or 'jack-knifed'. In steering a
wagon with a pony wheel assembly the turn was much easier as the rear wheels
followed the front wheels and only in too acute swings of the team was there
danger of the 'jack-knife' and capsize. Turning both types of vehicles was
much easier if there were only the polers pulling since the draught was under
greater control and more directly applied. This was impractical with all but
minor loads and larger and larger teams were the feature of the period.

In directing a large team the successive pairs applied power which had
to be resolved at a controlled rate down the drag line to carry out the
turn. Turning involved the selective adjustment of effort exerted by the
nearside and offside animals in each pair down the length of the team so that
those on the inside of the team stepped short but did not stop pulling and
those on the outside stepped long and maintained their slightly greater
effort. A large team, pulling a heavy load, had to be trained to allow the
polers and clammers to turn the front wheels into the curve of the turn. This
meant that the third pair acted like a clutch to moderate the power down the
drag chain, otherwise a straight pull of the forward section of the team would
drag the vehicle back into line and the turn was missed. Working on hilly
roads and in avoiding wet patches, turns had to be made with precision. If
the leaders began to cut into the turn too soon the team 'jack-knifed' and the
vehicle might run off the road or capsize.

Coming away on a turn or impacting a corner is soon understood by army
recruits or marching girls learning formal drill. The semi-trailer driver
also learns that his power unit, which is short in relation to the trailer, must be projected out in a turn to avoid the rear wheels impacting with the inner boundary of the curve, but not so wide as to lose control of the turn and have the vehicle run off the road. Teamsters operating a team of ten or twenty bullocks had a very long power unit and a short trailer and the power unit was made up of 'engines' that might attempt to make their own decisions. Thus, the level of conditioned response developed in the team by the driver was vital to his survival as a driver in the hundreds of difficult sections of any trip. His commands had to act as a series of clutching or braking actions on each section of the team. In effect, the teamster diverted the straight line of draught into a series of incremental changes by adjusting each pair of bullocks' rate of work. He had to select in advance the time and position for each pair of the team to moderate their pull and direction to carry out turns or the negotiation of both ascents and descents. Commands had to be given to each individual member of the team who had to respond within fairly tight tolerances otherwise the momentum of the team and wagon could be lost in being 'hung up' or in spectacular disasters in which the load and animals could be destroyed.19

The importance of reliable leaders in a team was rarely over stressed since their response to commands made for safe work or hours of frustration and extra work. Their role was concerned more with taking the correct direction at the correct time and place than with pulling the load.20 Large teams of more than ten bullocks were unable to work in narrow streets where they had to turn right-angled corners. The wide main streets of many country towns are considered the result of the demand for bullock teams to be able to turn around in the street. While this may have been the case for turning empty wagons, an additional reason was that large teams needed the space to negotiate right angled corners leading off the main street to river landings,
stores or roads leading to other towns. No feature of the teamster's work excited more comment than the use of swearing. Bullockies and bad-language seem inseparable in Australian folklore.21

Yet there are reports that many teamsters never used profanity.22 Unfortunately the preoccupation with bullockies' swearing misses the point and ignores the complexity of controlling a team. Bullocks were conditioned. The shout of the animal's name formed the cue word for the executive command that followed and swear words may then have operated as reinforcers before the whip brought its stimulus. Pavlovian conditioning was an observable fact in the operation of bullock teams in Australia decades before it was to enter psychological literature. Swearing and the crack or striking with the whip acted as reinforcers, but as Sydney Kidman explained, he never used swear words because he observed that such random words, given in anger, confused the bullocks.23 It would appear that many teamsters understood the need for clear and simple command words but no doubt there was much to cause a teamster to break into a few verses of 'bullocky's poetry'.24

The bullock-whip was an important feature of descriptions of teamsters. This instrument remained virtually unaltered in basic design and was generally the same throughout Australia, although the materials used varied. Made from a tapering stick about eight feet long with a plaited green hide whip eight to twelve feet long it carried a cracker made from twine or ribbon. Silk ribbon was considered one of the most reliable crackers.25 A number of observers noted that some teamsters were extremely cruel in using their whips as weapons on their bullocks or horses.26 Whips loaded with shot, wire or nails could do terrible damage to animals. Most teamsters, however, were aware that cutting open the skin or damaging the eyes of their beasts often led to infections and the probable loss of the animal from the team and less value in the market.27 Properly used the whip, or more correctly the
report of the whip, was the ultimate psychological and physical reinforcer of
the animal's conditioned responses. Bean noted that the explosive crack of
the whip after a command had been shouted made the message act
ively clear to
the animal and he was left never sure that the next time he might not be hit
with the whip. Teamsters who repeatedly hit their bullocks or horses with
whips gradually destroyed their conditioning and lost the shock power the whip
may have had.
Appendix IV  The Development of Australian Draught Powered Vehicles

Australian settlers inherited the results of the long European development of vehicle types and building techniques. Apart from the tabletop wagon virtually all Australian vehicles were derived from European forms. The main Australian contribution was that of adaptation and modification and the substitution of suitable local timbers. One important aspect of the development and employment of draught animal vehicles in Australia was the inversion of modern construction techniques in the improvement of an essentially obsolescent draught form. The bullock dray was a very ancient form in European terms. It had been almost completely displaced in Britain by 1800. The bullock dray, although highly suitable for pioneering conditions and where cattle had become relatively cheap and plentiful was a fairly crude vehicle with a limited payload. The Australian history of the vehicle may be considered to have been a regression to an obsolescent form combined with innovation within the form. Thus, the basic vehicle parameters remained the same but the constituent parts were modified and improved by better wheel design and construction, better axles and the selection of highly durable and robust timbers. The application of draught was at first reversionary, in the employment of shafts and reversed collars but this gave way to yokes and chains with the use of the pole. The scale of draught application appears to have been in contrast to that of anything known in Europe. Teams grew in number to involve ten or more bullocks with the dray and the subsequent use of the wagon, which had undergone similar development, teams eventually totalled twenty or even thirty bullocks. There seems to be a more complex process involved here than a simple linear drive to a 'modern' form.

The development and use of draught power in Australia has many similarities to that of Argentina and Mexico who drew their basic vehicle
technology from Spain. But they do not seem to have made as many changes to the form and capabilities of their vehicles. In both regions working cattle were used in arid areas but as the camel was the best solution in Australia, the mule provided the answer in South America. Ringrose argues that the more expensive mules, rather than oxen, were used in Mexico because the high value of the silver ore and the cheap fodder from grazing town commons made speed more important than the marginal increase in costs. This situation had its counterpart in Australia in the use of horses for the carriage of gold.\(^1\) In Argentina the dray drawn by oxen or bullocks was the dominant form. The parallel with Australian usage was that of cheap land and grazing and the need for a transport unit that could travel across country where there were few or no roads.\(^2\) Ringrose stresses that the two-wheeled vehicle used was an adapted or modified form of the heavy carts used in Spain.\(^3\) The Australian use of two-wheeled drays continued throughout the period but faced competition, especially after the 1860's from the larger four-wheeled wagons. Indeed Australian usage eventually resembled that of Western Europe and Britain. Jenkins notes that the distribution and use of vehicles in Europe conformed to a pattern. In the more mountainous and steep terrain the two-wheeled cart hauled by oxen was predominant. In the central plains areas the four-wheeled wagon, hauled at first by oxen and later by horses, dominated the haulage pattern. (In France there were areas where two- or four-wheeled vehicles overlapped.) In Britain this pattern was repeated in that two-wheeled vehicles dominated in the steeper terrain and wagons in the undulating and plains areas.\(^4\) In Australia the dray was, at first, the main vehicle in virtually all areas. But in the second half of the nineteenth century the terrain based pattern became fairly clearly established in general road haulage. (In this classification we exclude the combined use of two- and four-wheeled vehicles in the town and cities and the normal short distance
light load use of carts and drays on farms.) By the end of the eighteenth century there was a range of vehicle types in use in Britain adapted to particular haulage tasks and terrain. In the north the two-wheeled cart had been developed in a fairly robust form. The most standardised form was known as the Scotch cart. In the plains of England the four-wheeled wagon had emerged for bulky harvest cartage and long distance haulage of goods. Improvements in the construction of both types continued throughout the nineteenth century. Various frames and side panels were developed to carry particular cargoes. The box and the bow wagons were the two main design types. The two-wheeled cart had a capacity of about two tons, the wagon about four tons of corn sheaves or up to eight tons of compact cargo on roads.5

Inherited from Britain the basic types were in general use in New South Wales and Tasmania by the 1820s. The light cart or dray was used in a shaft configuration with a single horse or bullock for farm and town work. To carry greater loads this type was sometimes fitted with a pole and hauled by teams of two, four or six bullocks. To cope with the conditions of off-road work and heavier loads the heavy dray emerged based on the light dray or scotch cart design, but built in a much more robust and hardy fashion. This vehicle was fitted with a pole and hauled by teams of four, six, and sometimes eight bullocks. The English box wagon was in use, but in much smaller numbers than the dray, and the cost of a team may have been the main limiting factor. Wagons were hauled by teams of up to ten bullocks or harnessed teams of four or six horses. In addition to the cost of the wagon and the larger team the ability to find drivers skilled in operating teams was almost certainly a barrier to their use. Driving a large team of bullocks was a highly skilled task, as too, was the control of four or more horses in hand. The horse teams of this period were harnessed and controlled by the driver using reins, a task that required considerable skill.6 Atkinson notes

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that the wagon was a more useful vehicle when large loads were carried and it could be made to take frames to carry more wood, hay or other bulky cargoes. It also reduced the time and cost of transporting goods to the Sydney market since one wagon load could be taken for the equivalent of two cart or dray loads. The main drawback was that most of the wagons had their front wheels arranged outside the tray of the vehicle making them less stable and difficult in turns. The evolution and use of the main vehicles types has been summarised in Table 1. Numerous types were developed for special functions but they reflected similar developments being made in Britain and in most cases were derived from the basic forms shown below. The most notable exceptions to the types drawn from Britain were the German wagon, the distinctive Conestoga wagon and the Abbot buggy introduced from the United States of America.

<table>
<thead>
<tr>
<th>Basic Vehicle</th>
<th>Usage</th>
<th>Specialised Types and Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-Wheeled Cart</td>
<td>Farm and Urban Horse Cart</td>
<td>General purpose carting, butcher, baker, vegetables, parcels, light goods, etc.</td>
</tr>
<tr>
<td>Heavy Cart or Two-Wheeled Dray</td>
<td>Urban Dray Medium Farm Dray Heavy Haulage</td>
<td>General purpose dray, tip dray and spring dray used with shafts. Called the bullock dray, used with a pole and team.</td>
</tr>
<tr>
<td>Four-Wheeled Wagon</td>
<td>Urban Use</td>
<td>General purpose wagon, brewer’s wagon, horse lorry, low trayed town wagon or lorry, heavy town removal wagon. Box, bow and German wagon, farm and spring wagon. Light types: wagonette, light spring wagon, conestoga wagon and Abbot buggy. Robust box and tray forms with pony wheels, largest form was the table top wagon.</td>
</tr>
<tr>
<td></td>
<td>Farm/Rural Use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heavy Haulage</td>
<td></td>
</tr>
<tr>
<td>Timber Jinkers</td>
<td>Timber work and Large object carriage</td>
<td>Two- and Four-wheeled jinkers for timber work. (Solid and spoked wheel types). Large objects, piles, boilers, houses, etc.</td>
</tr>
</tbody>
</table>

Sources: Atkinson, Austin, Blake, Braden, Colwell, CCP, Jenkins, Ruhen, Stringer, Singer, Cuffley and Widowson.
The Development of the Heavy Dray or the Bullock Wagon

The two-wheeled ox-cart has its origins in the remote past, probably as early as three thousand BC. Various types evolved over the millennia and their influence on the development of modern vehicles is as yet only partially understood. In Britain, by the late eighteenth century, the Scotch cart was a fairly refined version of a robust and well balanced two-wheeled vehicle. Popular for short haulage in hilly terrain it could be used with shafts or a pole. A single horse in the shafts could pull about a ton on smooth surfaces and fitted with a pole a team of horses or oxen could haul two to almost three tons. The four foot diameter, or larger wheels gave it the ability to pass over uneven or difficult surfaces. It was four foot six inches wide, five foot six inches long and the sides were one foot six inches deep. Unsprung the iron axle was directly connected to the base of the timber tray.

The Australian dray appears to have been developed from the form of the Scotch cart. Development took two paths. One form was the light dray with shafts for farm and town use with one horse or a second for heavier loads and difficult terrain. The second was much heavier and more solidly built and was used with a pole and teams of horses, but more commonly with bullocks. The heavy pole dray or bullock dray was in fairly general use by the 1820s and built in local blacksmith shops it cost from twenty to twenty-five pounds. The dray's specific function was to carry produce and stores on made or unmade roads over long distances. This vehicle was an adaptation of a form for particular local conditions and needs.

The bullock dray design was influenced by the shape and weight of its main cargo and wool bale. The early bales were about four, by two and a half, by two and a half feet and weighed between 250 and 350 pounds. The dray was able to carry twelve bales, or about one and one half to two tons, without
becoming unstable. The tray of the dray was thus made a little wider and longer than that of the Sooton cart and the sloping front and rear panels were removed. The load was held in place by the two sides or by corner poles and ropes which held down the rainproof tarpaulin. The tray was about five feet wide and from seven to eight feet long mounted over two twelve spoked wheels four feet in diameter and shod with two or three inch wide iron tyres.\textsuperscript{14} Apart from hauling wool and stores it was popular with farmers, being strong and reliable, and it was possible to operate with lighter loads using teams of only four bullocks. Such an outfit cost thirty to forty pounds depending upon the price of the team.\textsuperscript{15}

In overlanding to Port Phillip and other squatting districts the dray was often fitted with hoops to spread an arch of canvas over the tray to provide protection for women and children travelling with the party. The covered dray or tilt cart was built and fitted out for twelve to fifteen pounds.\textsuperscript{16} The basic heavy dray was made larger and stronger during the 1860s and 1870s and built for wool and stores haulage in the central districts of North Queensland. This type was capable of carrying four tons and required teams of ten to fourteen bullocks.\textsuperscript{17}

The Development of the Four Wheeled Wagon

The four-wheeled wagon developed from the English box type eventually evolved into the giant 'table top' wagon of the 1890s. A number of English box wagons were in use in New South Wales by the 1820s but it was not uncommon for pastoralists to use both wagons and drays for wool haulage.\textsuperscript{18} The Australian Agricultural Company used four box wagons with Clydesdale teams during the 1830s.\textsuperscript{19} Caswell notes that during the 1840s wagons became more common, particularly in areas where the roads to the port towns had been
improved and in the plains country. The major incentives were the savings in trip time, when draught horses were used, and that the wagon could carry twice the load of a dray. The greater supply of draught horses in the 1840s drawn from studs like that of the Australian Agricultural Company enabled wealthy pastoralists to build up teams of Clydesdale and Suffolk Punch horses which were suited to hauling larger wagons. The earlier commercial hauler appeared to have adopted the wagon at this time but used the cheaper draught of bullocks. The extensive use of draught horse teams for heavy road haulage did not become common until the 1860s and thereafter. The basic wagon design was the English box wagon but the local type was made larger and much more robust to suit Australian conditions and made use of Australian timbers. The dimensions of the early types were 42 inches wide and 12 feet 6 inches long with 54 inch front and 65 inch back wheels fitted with five inch wide tyres.20 This vehicle was used extensively throughout the eastern colonies. In South Australia the German wagon came into general use in the late 1840s and from the 1860s spread to western Victoria and parts of New South Wales.21

The import returns from 1830 to 1850 record annual totals of between fifty and one hundred vehicles for each of the colonies. In addition packages of vehicle parts were imported but in both cases there is no information about the types of vehicles making up these figures. We can, however, assume that examples of the various types of English and German wagons arrived to be copied by local vehicle builders. The figures for the 1850s run at almost twice the level for the earlier decades. No doubt a greater range of luxury and exotic vehicles arrived during this period. Vehicles which introduced new technology, such as the through brace coach, arrived during the 1850s and were copied and modified by local builders.22 The English box wagon and the German wagon were fairly strongly built but without springs, they gave a fairly direct ride and fragile goods had to be protected by very bulky packaging.
Both types cost from twenty to thirty pounds to be built compared with fifteen to twenty pounds for a heavy dray. The early wagons had one major limitation. The smaller front wheels in turning acutely rubbed against the side of the wagon. This demanded a wide arc of turn and meant that they were difficult to use in hilly terrain and on narrow roads or tracks. Acute turns, apart from the increased wear and tear, often lead to the capsize of the wagon. Their advantage was that on reasonable terrain and formed roads they could compete with drays by carrying greater loads. This, however, demanded that on sections with heavy surfaces twenty to forty per cent more draught was required.

Margaret Kiddle suggested that the Americans, who were attracted by the gold discoveries, brought their light wagons which largely superseded the heavy Australian dray. It is difficult to find convincing evidence to support this view. Admittedly there appears to be evidence that Cobb and Co. used light wagons similar to the design of the buggy but there is no clear evidence that these in any way replaced the dray. The most important change in vehicle design from the 1850s was the more general introduction of 'pony wheel' assemblies in place of the fixed external wheels of the normal wagon. The pony wheels turned beneath the wagon body or tray on a flat plate of iron or steel. Improved versions were to incorporate inset rollers which made the turning action smoother. The size of the cargo space was extended out over the wheels and wagon capacity was thereby increased from four to six and up to eight tons. This development and the addition of springs became formalised in the spring wagon which, with its extensive iron work and steel, cost between fifty and eighty pounds to build. The common use of unsprung wagons using pony wheel assemblies and capable of carrying six to eight tons date from the 1860s. It may be that Kiddle refers to the Conestoga wagon but Blake argues that these were not imported or made in any significant numbers.
until the last quarter of the century when they became popular with hawkers and as part of droving plants.29

The larger road wagons introduced economies of scale in haulage since they could carry three or more times the load of a heavy bullock dray. The road wagon increased in size in the late 1860s and early 1870s with the introduction or extension of horse and bullock teams to twenty animals so that they were able to carry loads from ten to twenty tons. The aim was clear, as Barker stresses, teamsters from even the earliest years, sought to carry the largest load possible. The driver was normally an accurate judge of the team's strength and given fair weather over a known route he balanced the capacity of the team with the largest possible load in order to maximise the profit on the trip.30 The larger wagons were used extensively in the drier western areas of New South Wales and Queensland, northern Victoria and in parts of South Australia and Western Australia.31

The last quarter of the century involved teamsters carrying large tonnages of stores, fencing, building materials, chemicals and machinery as part of the capital improvements made on pastoral holdings, in the development of mining centres, rural towns and in the construction of railways. The greater output of the pastoral and agricultural sector also increased the demand for haulage. The growth in wagon and team size was a response to these two forms of demand.32 Large wagons were used for both short haulage to and from railheads and long distance haulage from remote areas of western New South Wales and in much of Queensland in which railway penetration remained modest until after the turn of the century.33

The giant Table Top wagon was a response to the demand for larger vehicles capable of hauling large bulky loads over relatively short distances. First built perhaps in the late 1880s, but certainly from the
early 1890s, the Table Top wagons were used fairly widely in the plains districts of Queensland and New South Wales until the late 1920s. This vehicle appears to have been an Australian adaptation of the wagon to its maximum usable size. Although larger versions were built, the normal Table Top wagon was about twenty feet long, eight feet wide, with front wheels five feet high and the back wheels seven feet high shod with tyres up to eight inches wide. At the turn of the century these wagons cost from 150 to 180 pounds.34 The tray was built out over the wheels and had no sides. The platform had a 'float', that is, the front and back were about two inches higher than the centre which caused the cargo to press toward the centre, making the load stable. The front wheels were built on a pony wheel assembly making turns easier but with a power plant of up to thirty horses or bullocks acute turns demanded huge clear areas of operation when the leading animals were over one hundred feet from the swivel pin. Capable of loads of fifteen to twenty tons, loads of twenty-nine and even thirty-two tons have been recorded but the distances for these feats were normally little more than ten miles. The average load seems to have been around twenty tons over good surfaces in the summer months. Wool and wheat were the main cargoes carried on table top wagons but their greatest utility was with bulky products like chaff and hay. Their greatest use was in relatively short to intermediate haulage to and from railheads in the central plains areas.35

Bullocks and horses were the primary power source used in hauling logs from Australian forests. In short distance haulage in the forests logs were snigged, that is, a chain was looped around one end of the log, and a team of bullocks hauled the log to a mill or a shipping point on a river. In moving large logs or sawn timber over longer distances two types of timber jinker were used. The two wheeled jinker, shown in Figure 1, was simply a wheel assembly to which, by means of a stout chain, the log was slung under the
axle. To carry very large logs the wheels were of eight or ten feet in diameter to provide the required ground clearance. The first recorded use of this type was made by David Collins in 1796 when some of the bullocks brought from India were used to replace human labour in getting timber. 36

Figure 9: Australian Timber Jinkers

a. The Two Wheeled Jinker

b. The Four Wheeled Jinker

c. The Block or Disc Wheel

Metal tyre: Four inches wide.
Solid red gum disc.
Metal axle sleeve.

--- 14" ---
The four-wheeled jinker consisted of a pony wheel assembly to which the rear wheels were linked by a pole and tie chains. The length of the jinker could thus be adjusted to suit the length of the logs, cut timber or large objects like boilers or houses that formed the tray or load. One important type of the four-wheeled jinker was that built using solid disc wheels cut from red gum and bound with four inch wide tyres. The axle was fitted through a metal sleeve mounted in the disc. The solid disc wheel was less easily damaged as compared to the spoked wheel which caught on branches and other forest debris. This type remained popular in the Riverina area until late in the twentieth century.37

The development of draught animal teams and team management was a response to the demands for transport in a particular pioneering environment in which bullocks and horses were the most suitable animals available. The vehicle developments were based on forms inherited and imported, principally from Britain, which were modified to better suit Australian conditions. Team management techniques were developed to enable the employment of larger power units needed to haul vehicles of greater capacity. The primacy of draught transport in the development and sustaining of the eastern Australian economies from 1830 to 1890 was the result of the efficient utilization of local resources and acquired technology that was reliable, efficient and relatively inexpensive.
Appendix V  The Operational Capacity and Limitations of Heavy Drays and Wagons

The changing pattern of vehicle usage in the nineteenth century was the result of an interaction of a number of factors, some related to the characteristics of vehicles and the draught animals used and others relating to the type and volume of cargo, the terrain, climate, relative costs and the impact of the river and rail systems. The main shift in vehicle use was from the widespread use of the heavy dray to more specialised vehicles and in heavy haulage to the four wheeled wagon. A comparison of the nature of the heavy dray and the wagon provides an explanation of their popularity and the reasons for their regional pattern of use.

Advantages and Disadvantages of the Dray

The bullock dray or heavy dray had a capacity of about two and one half tons and with a team of eight to ten bullocks could be used in almost any terrain with or without roads. The size and stability of the vehicle were greater limitations on the load than the terrain and the draught power used. Heavier loads could be hauled by adding more bullocks to the team, but with wool, the most common cargo, extra bales due to their shape and bulk made loads of more than two and one half tons unstable.¹ A cargo of metal or ore which occupied a smaller space gave loads of up to four tons without the loss of stability or cross-country capacity.²

The dray, with a stable load, was easier to manoeuvre in boggy or rough ground than a four-wheeled wagon. One wheel could be swung over the obstacle followed by the other. On gentle slopes a dray could cross at right angles but most drivers preferred to haul the load directly up and over ridges or hills to avoid the danger of overturning.³ This approach set the load limit at a about two and one half tons, since this was the capacity of a team
of ten bullocks. On particularly steep inclines two teams would take one dray over and return for the other. The safe passage of a dray down a hill imposed the major limitation on dray usage. The dray was an extremely difficult vehicle to brake. Mechanical brakes were at first rare since it was almost impossible to perfect a device or brake shoe that could apply equal pressure on both wheels at the same time. One wheel braked faster than the other caused the dray to slew to one side and capsize. If the dray was not slowed the weight of the dray and its load was projected via the pole on to the necks of the polers and their necks could be broken, or the dray could overrun the team breaking their legs.

A range of braking techniques were developed which aimed at slowing the whole dray and load rather than just a wheel. These included a drag - a tree trunk or log chained to the dray; the reverse drag - running a chain from a log down the slope around a tree at the top and connecting it to the dray; or the use of ropes played out from around a tree. The slowest method, perhaps one of the safest, was to take the load down in two trips. But this required much time and labour in unloading and loading. Double lock chains were used but these placed enormous strain on the spokes of the wheels. Chains were run from the front of the dray through the wheels to the back of the tray forcing the wheels to skid. Similarly, the brake shoe was employed. This was a metal tray like device which fitted over the tyre and was held in place by a chain connected to the tray of the dray. They were valuable on soft even surfaces, but should one of the wheels hit hard on uneven ground the rate of skid on one wheel changed and this could lead to a capsize, the dray swinging off the track or impact on the polers. Ruthen notes that the use of Australian hardwoods in building the heavy drays gave wheels of great strength which could take the strain of lock chains or the more common use of the 'sprag', the placing of a strong sapling through the spokes
Glen Hall's careful research has identified four types of brakes used during the period. The most common was the use of a drag, later brake shoes and lock chains were adopted, and not until late in the century were screw brakes introduced. The screw brakes had to be wound on at the same rate for steady and safe descents. This required two people co-ordinating the application of the shoes. The brake shoe was soon worn away after a few hill crossings. Teamsters found that the grass tree (Xanthorrhoea) was suitable and they cut brake pads from any trees found along the route. Logs were cheap and teamsters made monuments to their descent of hills by the huge piles of timber that littered the bottom of every steep slope.

The dray, with only two wheels, required careful loading to ensure it was balanced with the centre of gravity passing through or close to the axle line. A load pitched forward meant that much of the weight was transferred from the wheels to the necks of the polers. Similarly a load pitched too far back levered the pole up causing the bows to pull up on their throats. In extreme cases the polers could be lifted choking off the ground. The dray, although less in danger of jackknifing than wagons on steep descents, required effective braking and load adjustment. In ascending an incline some of the load had to be moved forward, on descending some of the weight had to be moved to the rear of the dray to avoid breaking the necks of the polers. These limitations in operating a dray in steep terrain were the major factors in the virtually unchanged size of the load carried during the period.

Advantages and Disadvantages of the Four-Wheeled Wagon

The four wheeled wagon was used extensively in the undulating plains of Australia. Shod with five inch or wider tyres the wagon was able to cover dry or sandy surfaces with loads to four times the weight of those carried by
drays. During the 1860s the wagon had begun to replace the dray on the inland plains. The dray was retained for short haul work on stations and in the towns. The wagons had a capacity of five to ten tons, but the load was limited by the size of the team available and the conditions of the roads. On the more mountainous terrain and in crossings to the coast the wagon was not in general use until the 1870s when the roads had been improved by cuttings, culverts and bridges. The average load carried during the 1860s was about four to six tons in the Murray-Darling basin area. During the 1870s and 1880s larger wagons were loading with eight to twelve tons on intermediate haulage to river ports and railheads in this area. McCulloch and Co. made extensive use of both their own and hired teams in bringing wool to their boats. During the 1890s wagon size and loads increased again to average some twenty tons hauled by teams of twenty bullocks or horses but the length of the trip had fallen to between twenty and forty miles. The capacity of wagons and the teams that pulled them shows three stages of development. In the first phase from 1830 to the 1860s their capacity was about four to six tons, from the 1860s to the 1880s between eight to twelve tons and from the 1890s they increased to about twenty tons.

The wagon was more stable to load than a dray since the weight was more evenly distributed over the four wheels. The delicate balancing of the load did not have the same implications for the team in a wagon as it did with a dray. However, even loading and avoiding too heavy loads were necessary to avoid mishaps. The greater stability of the wagon was offset by the demand for greater draught power since the wagon could not be swivelled around or over obstacles like a dray. The wide tyres of the wagon enabled it to pass over loose or stoney surfaces but when bogged it could not be manoeuvred out one wheel at a time as could the dray.
Wagons offered far greater safety than drays in descending inclines. Brake shoes like those used in Britain were placed on two wheels to slow the vehicle by skidding the wheels down the slope.\textsuperscript{15} Drags could be used but the cable brake was simpler. It operated like a winch, winding up and gradually slowing the vehicle. Screw brakes seem to have had a fairly early application. They were mounted on the rear wheels and were operated by winding down the brake pad or shoe against the tyre. These brakes had to be applied at the same rate, but they had greater tolerance than the devices used on drays.\textsuperscript{16} Braking a wagon in this way was more stable than a dray since the drag force was resolved through the centre or near centre of the wagon body and supported over the four wheels.\textsuperscript{17} The use of horses in drays and wagons provided a distinct advantage not available to the users of bullocks. Horse harness includes breeching, which consists of a broad strong leather band passed behind each horse's rear quarters and connected by straps or chains to the collar. Thus, when descending a slope the horses attached to the pole (wheelers) could lean back on the breeching and assist in slowing the vehicle. Large powerful horses used as wheelers served the dual function of giving power to swing the wheel assembly into turns and to act as brakes. On shallow slopes the screw brakes were often unnecessary as the horses could slow the momentum of the vehicle.\textsuperscript{18}

The strengths and weaknesses of a vehicle and its suitability on different terrain were important factors in determining the extent of its use. An additional factor that influenced the choice of vehicle and animals used was the type of harness employed to deliver draught power. In antiquity the yoke rested on the withers of oxen and was held in place by a strap around the neck. Another fairly inefficient method was to tie the yoke to the beast's horns. During the sixteenth century stiff inverted collars were used to try and improve the bullock's delivery of draught power. Since the
seventeenth century the wooden yoke became the normal form in Britain and Europe. Effective horse harness was much slower to develop. The very early neck band and the soft collar or ring were ineffective. In work they pressed on the trachea and prevented horses from exerting their full power. The chest band was an improvement but restricted the horse to work between shafts. These forms of harness limited horses to loads of four to five hundredweight. One advance made in the ninth to tenth centuries was the fixed wooden collar mounted as part of the shafts which increased the draught power a horse could deliver. The most efficient form of harness became general in Europe by the twelfth century. This consisted of the stiff shaped collar, hames and chains or leather traces. This has remained the standard form to the present. The multiple harnessing of horses did not emerge until the late Middle Ages.

Although the modern form of harnessing horses and the use of yokes with bullocks was long established in Britain, the settlers in Australia to the 1830s experimented with various forms. One explanation was that government officials and settlers, in a period when there was a shortage of draught animals, were keen to use animals individually rather than in teams. Governor King, in 1804, noted the use of bullocks in horse harness which was preferred by settlers to the use of yokes. There was a relative shortage of horses but there appears to have been plenty of horse harness. The bullocks were harnessed with the horse collar reversed and by this means one animal could be used to pull a vehicle as opposed to the two needed for use in yokes. By 1806 the government bullocks numbered more than one hundred and they were used both in yoked teams and singly with horse harness. Yoked pairs became more common as the yoke was cheaper to make and needed fewer repairs than horse harness. In Tasmania the use of bullocks with horse harness was a common feature of carting and farming work to the end of the 1820s.
additional reason for this was probably related to the levels of expertise the settlers had or lacked in using draught animals. Harnessed bullocks gave the driver a greater sense of control than they had with yokes. Just as some people preferred horses with reins and bridles or wickers due to the greater feeling of control of the bit in the horse's mouth. It took time for the skills of conditioning and controlling teams by verbal commands and whip cracks to spread in the settlements. Ironically, the great horse teams of the later part of the century were operated without reins. The use of a single harnessed bullock in a vehicle fitted with shafts remained fairly common for light work on stations and farms and even in town carting until the 1860s. A large strong bullock could pull a load of about half a ton and the outfit was cheaper than using a horse.

Heavy drays with shafts carrying loads up to two tons were used from the 1820s to the 1840s. The shafter was assisted by yoked pairs making up teams of five, seven or nine bullocks. This arrangement made the application of the draught power of the yoked bullocks more complicated. The yoked bullock's drag chain was connected to the dray using a 'splitter' to carry two chains around the bullock in the shafts. George Cox's bullock dray and his horse wagon were harnessed in this manner using five animals in each. The fixed shafts and pairs arrangement had serious limitations which led to its replacement by the pole dray. The loading of a shaft dray was crucial to its successful operation. If the load was not carefully balanced the resolved weight was carried on the neck of the shafter when descending slopes. This could bring the shafter to his knees or if the weight was suddenly applied his neck could be broken. On the upward slope the shafter might be strangled, and indeed from the accounts of observers it was common for shafters to be killed. To avoid this in crossing hills the load was moved forward on the upward slope and two bales were moved back onto a small platform at the rear.
of the dray on the downward slope.  

The pole dray appears to have begun to replace the shaft dray from the middle of the 1830s as a result of the demands for larger loads and the better handling characteristics. Two bullocks carried the forward thrust of the load and additional pairs were added to the team so that heavier loads could be carried over greater distances. The polers' task was to hold up the pole and resist the forward thrust in descents and in this harness they were less likely to be killed than a shafter, should the dray capsize, since the ring bolt on their yoke turned over with the pole.  

To reduce the thrust or drag on the polers the movement of the load was required less often on moderate slopes.  

The sensitive balancing of the dray and the work needed to protect shafters or polers was not required in the use of four-wheeled wagons. But the larger loads carried by wagons meant that they were more inclined to 'jack-knife' and capsize if they had to cross slopes at an angle. Additionally, the larger loads made the provision of reliable brakes essential to avoid running down the team when descending hills. The use of the wagon tended to be limited to the plains country until the 1870s by which time brakes were more reliable and reasonably good roads had been established on the main routes to the coastal towns.  

The structure of the dray limited its possible expansion in load capacity. Adding more animals to the team resulted in surplus power capacity without any significant increase in haulage capacity. By contrast wagons, particularly those with a pony wheel assembly, were capable of being made wider and longer. The heavy bullock dray, with the exception of the north Queensland type, remained little changed with a capacity of two to two and one half tons and a team of between eight to twelve bullocks from the 1830s to the 1860s and later. The light wagons first used
in the late 1820s were gradually replaced by larger, heavier wagons which by the 1870s began to dominate haulage. This response to the demand for greater haulage and for a more efficient vehicle also depended upon the supply of greater numbers of bullocks and horses. The last quarter of the century was the age of the big teams when twenty or more animals were used.\textsuperscript{33} The normal harnessing of teams was to hitch successive pairs in line but this made the power unit unwieldy. To reduce the length of the team horses were hitched three abreast after the wheelers. The use of twenty ton wagons from the 1880s employed a modification to the use of the pole. A triangular form was attached to the end of the pole and bullock or horse teams were then hitched in two lines of pairs reducing the length of the team by half. This meant that teams had to have wide routes and unloaded or light traffic was required to give these teams right of way.\textsuperscript{34}

The pole dray replaced the shaft dray. It provided greater capacity and removed the loading limit set by the strength of the shafter's neck. The prolonged use of the dray in heavy haulage reflected its ability to carry two tons 'up and over' on steep terrain whereas the wagon needed good roads and cuttings in these areas. The elastic supply for drays from full- and part-time carriers and the low-cost of entry meant dray operators were able to win a share of carrying in the coastal zone by concentrating on high value products. The wagon made its impact from the late 1860s and offered greater load capacity, easier handling and greater stability on reasonable terrain. The lower prices for draught animals, improved brakes, and the reduced need for long distance haulage led to wagons pulled by bullocks, but more commonly by horses, replacing the heavy dray from the 1870s.
Appendix VI  Terrain and Climate: The Use of Donkeys and Camels in Australia

In terrain where there are no tracks wide enough for vehicles goods can be carried by pack animals. In some of the mountain areas of Australia, such as Gippsland, the Snowy Mountains and parts of the ranges in Queensland men worked as pack carriers. They carried food, tools and equipment into remote mining and timber camps. As late as the 1870s and 1890s human packers worked in these areas.\(^1\) Human beings, capable of loads of up to one hundred pounds, were replaced by pack bullocks or horses. The load in addition to the pack frame or saddle was normally 200 to 250 pounds weight. This depended upon the terrain and the size of the animal.\(^2\) The Walhalla mines in the Victorian ranges provide a typical example of the reasons for pack animal use. Gold, a product of high value, could support the high cost of goods and freight. Access from Melbourne was, at first, so difficult that stores were shipped to Port Albert, carried by redoubtable teamsters like Mrs Bunting and others to the Bald Hills and from there by pack horse to Walhalla. The price of a bag of flour in Walhalla in the early 1860s at five pounds was as high as it had been in Bendigo in the first winters of that field.\(^3\) In the worse winter months of the 1850s the gold fields at Ballarat and Bendigo had had to rely on pack horses for guaranteed delivery of supplies. In mountainous areas pack animals were able to negotiate unformed tracks which were too steep or narrow for any form of wheeled vehicle. Pack animals such as horses, bullocks and donkeys have limitations. They can only carry between 200 and 250 pounds weight and this load has to be divided into two equal parts to balance the pack saddle. Thus, only goods which could be broken down were carried. The pack string operated with animals moving in single file. This limited the number of animals in a string to ten since they covered fifty yards and
greater numbers, especially in timbered terrain, became impossible to handle. Their high operating costs and small payload meant that pack animals were replaced as soon as a track wide enough to take a bullock team was cut through the bush.

One of the earliest alternatives to draught bullocks and horses used in Australia was the donkey. Five donkeys were imported by the government in Tasmania and by 1819 a team of sixteen were working with the public works section in Hobart. There are fragments of information about other imports during the early years of settlement but the donkey appears to have been soon replaced by the more general employment of bullocks and horses. During the 1840s an effort was made by the Australian Agricultural Company to establish mules as draught animals in New South Wales. Thirty mules and two stallion asses were imported from Chile with a number of Chilean mule drivers. The company had experienced great difficulty and delay in using pack bullocks and horses in carrying stores from Gloucester to their Liverpool Plains stations. The mules were able to cover the rough track in less than half the time of the pack bullocks. The mules were unable to carry a larger load but they were faster and required less fodder. They were also less prone to straying or becoming footsore. The three strings of ten mules were able to carry three tons of flour over the route in five weeks whereas attempts using a bullock team and dray had taken almost as many months. The mules' advantage over the pack horses were the mules' greater ability to live off the fodder along the route and to avoid becoming lame on the rocky sections.

Donkeys and mules appear to have played no significant role in pastoral, agricultural and general haulage developments until the 1900s. Their greater use from 1900 until the 1920s was in direct response to the extension of pastoral and mining developments in the more arid regions of
Western Australia, South Australia and Queensland. The long drought at the turn of the century and the arid nature of the regions bordering the centre of Australia appear to have stimulated an interest in draught animals which needed less fodder and water than horses and bullocks. In 1866 Sir Thomas Elder imported a selection of donkeys. They were bred in small numbers and used in station and cartage work in South Australia. In 1904 a shipment of 125 donkeys was made to Mauritius. Similarly, a small export trade developed between Queensland and Fiji. Until after 1900 donkeys and mules were said to have not 'caught on' in Australia. Breeding of quality donkeys and mules in South Australia at Elder Smith's, Cordilla Station and by Mr J. N. Smith provided stock for local use and a modest export trade with South Africa. Donkeys were used in the Flinders Ranges and the northern districts of South Australia before the First World War.

The mule had long been an integral part of transport in the arid regions of the United States before it was given greater use in Australia. The Pastoralists' Review in 1911 carried a number of articles relating the usefulness and qualities of donkeys and mules in arid zones. In 1911 shipments of donkeys were made from South Australia to various pastoral companies in Western Australia. Their use in northern Western Australia and western Queensland steadily increased. In the western division of New South Wales small numbers were employed in teams working in the dust or drought affected areas from before the War until the 1920s. In 1911, 800 mules were reported working in Queensland's arid districts. Hardy and able to work on food derived from scrub and bushes the donkey and mule had their greatest impact as station and road teams in Western Australia. H. M. Barker argues that pastoralists' concern for maximising the numbers of sheep carried on their stations saw that donkeys or mules provided less competition for fodder than bullocks and horses. From 1910 in the Kimberley region cattle tick and
red water disease also added to the adoption of donkeys and mules in haulage.\textsuperscript{18} A major reason for their use in Queensland was the cattle tick. By the 1930s motor vehicles had begun to replace them.

Camels were proclaimed the solution to inland exploration in a memoir by James Ballantine to the Secretary of State for the Colonies in October 1827.\textsuperscript{19} Ballantine suggested that exploration from the west coast to the eastern settlements could best be accomplished by the use of pack camels. He argued that camels could carry greater loads than horses or bullocks, they were more hardy, and better able to survive in areas short of grass and water.\textsuperscript{20} He, rather optimistically, calculated that the west to east journey of 3,000 miles could be carried out safely with a party of twenty men and fourteen camels moving at an average rate of twenty miles a day. Each camel would carry 500 pounds weight of stores, since wild game would supplement the party's rations. A few horses were added for scouting and safety.\textsuperscript{21} The feasibility of the scheme was not tested until after the central regions of Australia had been explored using various combinations of horses, bullocks and camels. In recent years it has been shown that, while Ballantine's number of camels may have been understated, the crossing of the continent using camels has been both possible and practical.\textsuperscript{22} During the 1840s small numbers of camels were imported to South Australia and Victoria but apart from John Horrocks's expedition to the Lake Torrens area they were looked upon as little more than novelties.\textsuperscript{23}

The use of camels by Burke and Wills showed that they were invaluable in the northern section of the route but the overall disaster added little to the prestige of the camel. McKinlay's successful use of camels in the relief expeditions received little mention. The most important importer and promoter of the camel was Sir Thomas Elder who commenced his camel breeding operations
with 122 imported from India in 1866. Elder established a carting company that used camels which was instrumental in increasing the use of camels in South and Western Australia. The value of camels in arid areas was seen their use on the trans-continental telegraph where few were lost, whereas the mortality amongst the eight bullock teams and fifteen horse teams was high.

Elder and other breeders imported camel stock to expand their studs and from 1854 to 1889 over 1,000 camels were landed from India.

Figure 10: Camel Numbers and Distribution in Australia

T.L. McKnight has provided a thorough study of the camel in Australia and shows that its period of greatest use was from the 1890s to 1930. The graph gives the trend of camel numbers and shows that their greatest use was in South and Western Australia. In the drier areas of western New South Wales and Queensland the camel also made a considerable impact in carting. McKnight's map of the regions in which camels were used shows their importance in arid regions.

Areas of Camel Carting Operations 1890 - 1930

Source: T. L. McKnight, op. cit., p. 53.
Camel numbers and usage were at their highest during the period 1911 to 1927. The use of camels in carrying freight from Adelaide to Wilcannia and other towns in the western division began in 1869. Wool bales were loaded on sixty-five camels as back freight to Adelaide. The use of camels in carrying along the Adelaide to Charleville corridor steadily increased from the 1870s. By 1894 camel teams were major rivals of horse and bullock teams in this area. The prevalence of cattle tick and pleuro-pneumonia were contributing factors to the success of camels. Pastoralists acted on the knowledge that drought or dry summers so reduced the roadway supplies of grass and water as to bring horse and bullock teams to a halt. Rather than wait eighteen months or more to have their wool carried pastoralists placed their orders with the cameleers to break the carrier's strike on the Warrego to Burke route. The camel teams were halted by only the harshest droughts. Camels were operating well into the Channel country during the 1890s. Carrying east to the railheads at Cunnamulla or south through Hungerford to Burke. Two Afghan carrying companies were operating from Burke to the Thargomindah district in 1898. The Carriers Union became alarmed at the impact of the cameleers who were charging half the normal teamster rate for back loads of wool. At fourteen pounds a ton for stores from Adelaide to Wilcannia the teamsters felt the cameleers were unfair competitors. In 1894 they pressed for the passage of the Camel Restriction Bill in New South Wales. A similar call for restrictions on camels by carriers in the Charleville district in 1893 was rejected by the Government which pointed out that the drought had been the main cause of the cameleers success.

The camel made little impact in cartage in the central and eastern divisions of New South Wales and Queensland. McKnight's map shows that their forte was working in the more arid regions or in areas suffering from drought. The horse and bullock teamsters used droughts or the shortage of
grass and water as a lever to increasing their charges. The cameleers broke the teamsters' long monopoly in setting prices. Hostility to the camel was also fixed by ignorance and bias. H.M. Barker was probably correct in describing the camel as the animal most misunderstood and denigrated in Australian history.\textsuperscript{34} His book is one of the best accounts providing evidence of the camels' suitability for draught work in arid areas. Finlayson has captured the Australian bias 'the horse and his use are so closely woven with the history of the human race, that sentiment and aesthetic appeal lead to the glossing over his many defects, and in a land strongly committed to horse craft, the camel, as an alien, has won his triumph in the face of scornful prejudice'.\textsuperscript{35} Good seasons, the extension of rail and the introduction of the motor truck eventually reduced the scope of camel haulage.\textsuperscript{36}

The main transport utilities of camels, horses and bullocks are related to their draught capacity and their ability to operate in different environments. In pack work camels can carry five hundred pounds and travel twenty miles in a day while horses can carry only half this weight and travel up to thirty miles a day. In draught work camel teams are capable of hauling heavier loads than horses or bullocks.\textsuperscript{37} Indeed the greatest difference in draught is that eight camels can haul a load of four tons but this might require ten bullocks.\textsuperscript{38} In the wide range of soil surfaces, vegetation and climatic conditions in Australia, there are very few areas in which horses, bullocks or camels are mutually excluded. On stoney ground horses are better than bullocks or camels. Camels can work in areas denied to horses due to the lack of suitable fodder since the camel can forage at greater heights on shrubs which horses will not eat.\textsuperscript{39} Horses and camels cannot survive without water. In arid regions, however, a camel had the advantage of being able to travel for six to eight days or 130 miles without water whereas a horse's limit was three days. This factor and the camel's catholic taste in fodder
mean that in particular seasons some arid areas could be crossed by camel but not by horses.\textsuperscript{40} Horses, bullocks, donkeys and camels were complimentary modes of draught power having particular areas of optimum use.\textsuperscript{41}

\textbf{Appendix VII Regulating Road Users}

An estimate of the impact of narrow and wide tyred vehicles on the road surface can be drawn from the pounds per square inch pressure exerted. A dray of three tons gross weight with two inch wide tyres applied a pressure of 840 pounds per square inch (assuming a road contact point of two inches) by each wheel. A four-wheeled wagon of ten tons gross weight, with six inch tyres, assuming the same contact point, applied only 466 pounds per square inch.

The damage done by narrow tyred vehicles was the subject of debate and regulation for over a hundred years in Britain. To preserve roads parliament experimented with a wide range of measures assigned to regulate the types of vehicles used. Attempts were made to control vehicle size, carrying capacity, width of tyres, the type of wheels and the number of draught animals.\textsuperscript{1} The acute pressure on colonial roads in the early years of the gold discoveries lead to consideration of similar measures to protect the existing roads. The rough standardisation of the bullock dray by this time and the limited range of what could be called good roads appear to have weakened the case for tough regulation. The earlier requirements to buy licences for carts, coaches, drays and wagons, established in Maquarie's period remained and were adopted by local authorities in the other colonies. This provision was not used to provide large sums for road building and appears to have been applied fairly lightly. Most farm or rural vehicles escaped. In 1860 the Central Road Board
of South Australia took the provision further and attempted to apply a fairly heavy tax to all vehicles to raise money for road building. The public protests and removal of many of the board representatives brought this tax to an end in 1851. The subject was given attention from time to time in the colonial parliaments from the 1850s to the turn of the century, but the complexity of the factors involved in regulating a wide range of vehicles from gigs to heavy wagons normally meant that few measures were ever made or remained law. By the turn of the century regulation centred upon the gross weight per half-inch width of the tyre. A fairly general rule was eventually set that the maximum load should be five hundredweight per inch of tyre width.

The many attempts to make narrow-tyred vehicles pay more for road access was but one factor in the shift to wide-tyred wagons and the cart, dray and buggy owners provided a mass of opposition to the regulation of narrow tyres. The heavy wagon, however, became more common from the 1870s. The threat of regulation, greater awareness of the nature of traction and improved aspects of the road systems all contributed to the use of wider tyres. The increased pace of economic development with all its attendant cartage tasks in building towns and railways, and in the delivery of greater volumes of stores and equipment to the interior, and the outward flows of products increased the demand for larger haulage units. The greater economic efficiency of the wagon stimulated the switch from drays. The wagon carrying from five or more tons was less costly to operate than the dray. The dray or cart was still efficient in short haulage of valuable or perishable goods like fruit, vegetables or minerals, but for wool, wheat and fodder the horse wagon had distinct economics of scale. The operators of wagons found that wide tyres of six or eight inches were the most efficient for loads to twenty tons. Economic factors had more influence in the use of wide tyres than government regulations.
FOOTNOTES: APPENDIX III

1. See D. Collins' comments on a yoke of oxen in HRA, III,1, p. 354.


4. See New South Wales Census, November 1828.

5. The material used to establish this typology has been culled from dozens of sources. However the general development of vehicle types used for haulage has been drawn from the following authors. I. Badger Australian Horse Drawn Vehicles, Adelaide, 1977, pp. 47 and 53; L. Blake Covered Wagons in Australia, Adelaide, 1979, pp. 13-32, passim. See also M. Stringer Australian Horse Drawn Vehicles, Sydney, 1980, and P. Cuffley Buggies and Horse-Drawn Vehicles in Australia, Lilydale, Victoria, 1981.


8. L. Braden op. cit., p. 113 and p. 134.


13. H. Caswell op. cit.; Mackinnon Papers, Ledgers of Jancourt Station, Victoria, Manuscript Collection, MSS, La Trobe Library, Melbourne.

14. L. Braden op. cit., pp. 47-8. For horse teams similar commands are given with the additional 'steady' or 'easy now' to moderate speed or effort. M. Telleen op. cit., p. 301.

15. K. M. Dallas Horsepower, Hobart, 1967, p. 40; is the only author who has noted this aspect but does not make use of the psychological term.


18. L. Braden op. cit., p. 83.


25. K. A. Austin op. cit., p. 28.


27. C. E. W. Bean op. cit., p. 124.

28. O. Ruhem op. cit., p. 178.

APPENDIX IV


2. Ibid., pp. 40-44.

3. Ibid., p. 44.


5. Ibid., pp. 10-3.


7. Ibid. See Figure 1 in Technical Appendix 3 for the range of vehicle types.


9. Ibid., p. 16.
10. C. Singer (ed.) A History of Technology, Vol. 2, London, 1956, pp. 145-6. Since most vehicles were built by individual makers or very small firms the dimensions varied from place to place but generally conformed to the above figures.

11. L. Braden op. cit., pp. 36-7 and p. 118. Braden also notes that a primitive form was built from local materials when wheelwrights were not available. Two wheels were cut, about a foot thick, from a large log. A hole was burnt through the centre and a stout wooden axle fitted. The axle was lubricated with tallow or animal fat, but since the wheels were not aligned these vehicles gave a very rough ride and probably had a fairly short working life.


16. G. Somerville Account of a Journey from Sydney to Melbourne in 1838, MS, Manuscript Collection, La Trobe Library, Melbourne, p. 11; I. Badger op. cit., p. 11.


20. L. Braden op. cit., p. 65; H. M. Barker op. cit., p. 7. See also C. Singer op. cit., pp. 147-8 for details of the original English type.


23. I. Badger op. cit., p. 47; CCP., Vol. 2, p. 321, Vol. 3, p. 234; See also Chapter 8, for the long run costs of the various vehicle types.


26. O. Ruhem op. cit., p. 190-91; See also C. Singer op. cit., pp. 147-8 for
details of the European experience in this development. The Australian
use of this change was derived from Europe. The Table Top Wagon was a
local extension of the technique.

27. I. Badger op. cit., p. 53.

28. O. Ruhem loc. cit.


32. See Butlin's figures for increased sheep numbers and wool output and the
growth of rural Australia from 1860 to 1900. N. G. Butlin op. cit., p.
67 ff.

33. See Chapter 8


35. O. Ruhem op. cit., p. 194, L. Braden op. cit., p. 108ff for details of
record loads and the largest wagon built. The large Table Top wagons
were popular with produce merchants in Adelaide, 1900-1930. They were
used to bring hay from Gawler to Adelaide. The wagon was fitted with
high frames to retain the hay and pulled by up to ten Clydesdale
horses. Discussion Dr. F. K. Wallace.


37. L. Braden op. cit., see the pictures opposite p. 50 and p. 99. Interview
with the staff of the Swan Hill and Echuca Museums, Victoria, September
1980; O. Ruhem op. cit., p. 197 and p. 211.

APPENDIX V

L. M. Quinlan Here My Home, etc., Melbourne, 1967, pp. 126, 132; K. T.
Cameron notes that 10 to 12 bales made up a 2 to 2.5 ton load stacked
three tiers high. Another layer made the load unstable. See also J.
Nisbet 'Transport on the Western Road in 1836' RAHS, Vol. 11, Pt. IV,
1925, p. 235; O. Ruhem op. cit., p. 154; G. Hall op. cit., p. 17.

2. H. M. Barker op. cit., p. 176; L. Braden op. cit., p. 29.


4. O. Ruhem op. cit., p. 100; L. Blake op. cit., p. 12; M. Colwell

135
5. Glen Hall op. cit., pp 16-7, p. 81. See also G. F. James (ed.) op. cit., p. 111 for details of the tools carried by bullock drivers used for making running repairs. The two essential tools were an axe and a strong spade.

6. An observation made by most travellers visiting Australia from the 1830s. See G. Mackaness op. cit., p. 246.


8. O. Ruhen op. cit., p. 115.

9. SMH, 29 August 1864; Pastoral Times, 10 September 1864; 12 December 1864, 6 May 1865.

10. G. Hall op. cit., p. 78, See Also Chapter 8.


12. Ibid., Box 29/4.

13. H. Coulson op. cit., p. 115, see also the Records of Perricoota Station, New South Wales, held by the Echuca Museum, Echuca, Victoria and H. M. Barker op. cit., p. 43 and pp. 77-8, who notes that from 1900 in the more arid areas of Western Australia the average wagon weighed four tons and could carry loads of fourteen to twenty tons.


16. L. Braden op. cit., p. 30, p. 80. The 'offside' job was to wind one at the same rate as the driver wound the other.

17. O. Ruhen op. cit., p. 198.


22. HRA, 4, pp. 493-4; HRNSW, 5, p. 337.

23. HRNSW, 6, p. 158.
24. HRA, III, 3, p. 615.

25. See J. Atkinson's description of how he controlled his bullocks using bridles etc. op. cit., p. 189.


27. Details of Cox's teams see C. J. King op. cit., p. 526. See the description by Mrs S. Stranger of such teams crossing the Blue Mountains in G. Mackaness op. cit., pp. 259-63. See also Glen Hall's emphatic rejection of the account by Patrick Leslie of using seven bullocks in drays. Contrary to Hall's view this form of harnessing was common. G. Hall op. cit., p. 16.

28. See the typical description by Mrs E. Hawkins in G. Mackaness op. cit., p. 108.


30. A. Caswell ibid.


32. O. Ruhen op. cit., p. 68.

33. L. Braden op cit., pp. 96-130, passim.

34. D. Harris op. cit., p. 6-40; It was normal in the nineteenth century for loaded vehicles to have right of way but for this type of team there was no room for another vehicle to pass on narrow roads or streets. See L. Blake op. cit., 'Wagons' p. 26 for details of other forms of hitching for horses teams, including tandem, tandem, trandom, outrigger, three abreast and four abreast with single and double shaft forms.

APPENDIX VI


2. Ibid., pp. 83-85, for a description of pack horses operating in the Dandenong ranges.


5. HRA, III, 3, p. 413.

6. HRA, I, 25, p. 269.
7. A. A. Co Dispatches, 2/4/1840, MS 78/1/16, p. 353, ANU Archives, Canberra.

8. Ibid., Dispatches 1/5/1841, MS 78/1/16, pp. 716-7.


10. APR, 16 May 1904, p. 168.

11. APR, 15 August 1911, p. 617.


13. W. Hatfield ibid., p. 33.


15. APR 15 August 1911, p. 617.


17. APR, 15 November 1913, p. 1078.


20. Ibid., p. 558.

21. Ibid., pp. 559-60; Ballantine's scheme was never adopted.

22. See Tom Bergin In the Steps of Burke and Wills, Sydney, 1981.


27. T. L. McKnight op. cit., pp. 72-3.


29. O. Ruhen op. cit., p. 159.

30. The Australian, 7 April 1894, p. 582.

32. APR, 15 June 1894, p. 185-6; The Australian, 7 April 1894, p. 582.

33. The Australian, 19 December 1893, p. 1022.


38. H. M. Barker, ibid.


41. H. M. Barker op. cit., p. 197.

APPENDIX VII

1. C. I. Savage op. cit., pp. 14-5 provides a summary of the vast array of regulations used in eighteenth and nineteenth century Britain.

2. I. Auhl op. cit., pp. 73-83. The tax was based on regulations used in Britain. The tax aimed at penalising users of vehicles with narrow tyres who were charged two pounds per vehicle while wide tyres paid only one pound to one pounds ten shillings.

3. The rates were occasionally based on tyre width. In 1867 the Victorian rate for six inch tyres was eighteen pence, for six to nine inches only nine pence and more than nine inches only four and one half pence. VPP LA V & P, 1867, Vol. 2, Report of the Select Committee on the Seymour Bridge.

In 1867 South Australia introduced maximum loads based on the width of the tyre. Victoria in the 1890s adopted the following scale:

- 2 inch tyres maximum load 3 ton 12 cwt
- 4 inch tyres maximum load 7 ton 4 cwt
- 6 inch tyres maximum load 10 ton 16 cwt
- 8 inch tyres maximum load 14 ton 8 cwt

See L. Blake Wagons, p. 52
4. For an extensive discussion of the problem in the period up to the introduction of vehicles with pneumatic tyres see J. M. and H. E. Coane op. cit., pp. 30-32.

5. G. Hall op. cit., p. 18, four and five inch tyres were in general use by 1860.

A. Livestock and Cultivation, New South Wales 1788-1821.

B. The Number of Cattle and Working Oxen, New South Wales 1788-1830.

C. The Number of Horses in New South Wales 1788-1830.


E. The Price Range of Horses, New South Wales 1788-1830.

F. Australian Horse Trade, Gross Exports 1816-1860.

G. Australian Horse Exports to Foreign Countries 1816-1860.


I. Australian Horse Exports 1861-1930/31.

J. Distribution of Horse Exports to Market Zones 1861-1930/31.


L. Imports of Stud or Pure-bred Horses to Australia, 1820-1919.
Introduction and Notes to the Statistical Appendices

The research, development and construction of the statistical appendices was a central task in preparing a statistical basis for the thesis and in every case possible the figures in the tables have been checked, cross-checked and given critical tests to make them as valid as possible. The writer has been as thorough and critical as time and money allow in the search for and use of statistical sources. The examination and use of the records held by the main public and university libraries in eastern Australia and the holdings of the Commonwealth Bureau of Census and Statistics leads to two conclusions. First, it is essential that researchers have a central depository in which all the existing statistical records are housed in order that they become more accessible and to ensure their safe keeping. Second, one is forced to agree with Dr. Edgars Dunsorfs (The Australian Wheat-Growing Industry, pp 520-1.) that a critical view of evidence is fundamental to the writing of history, but equally one must be critical of those governors, officials and statisticians who made negative remarks about statistical records, especially about the records prepared before their term of office. It has been found that tests of the recorded data for the nineteenth century vindicate the work of the recorders. Thus a sudden fall in the number of horses can be found to be the result of a harsh drought rather than faulty work by the compiler of the figures. Similarly, apparent leaps in the number of horses have been found to be well within the breeding possibilities of the existing stock. In general, the recorded figures have been found to be very reliable and the major problem has been where there are no recorded figures for horse imports, exports and numbers for various periods or where the data on horses was not recorded separate from that of other livestock. This was the case for the imports to Western Australia until 1888.
These appendices form the only existing complete statistical record of many aspects of the history of horses in Australia. The appendices have been constructed to contain full sets of data while the tables in the text are normally shorter forms or summaries of the same data. The aim has been not to overburden the text with complex tables but to maintain the fullest record of the information in this section of the thesis. Statistics used throughout the thesis have been developed from many and varied sources and these cannot all be listed at the end of each table or paragraph. Thus a reference has been made to the main source or sources at the end of the table or appendix. The full range of sources that have been consulted and used are listed in detail in the bibliography under the section given to official records.

A number of secondary sources have been found to be of considerable value in providing general information about aspects of the eastern Australian economy which had an impact on the employment of bullocks and horses.

The following have been used as authoritative sources:-

Alan Barnard  The Australian Wool Market 1840-1900;

Noel Butlin  Investment in Australian Economic Development 1861-1900;

Edgars Dundorfs  The Australian Wheat-Growing Industry 1788-1948;

Brian Fletcher  Landed Enterprise and Penal Society;

and the excellent historical statistics in the Victorian Year Book 1973. There is no accurate guide to the location of historical statistics in Australia, however, Jennifer Finlayson's Historical Statistics of Australia is an invaluable guide to what can be found.
Notes to the Appendices

a. In the appendices data is not available for the years that have been omitted and a blank line in a column indicates that the data is not available. A dash or nil is used where the records show that there was a nil return for that date. The letters n.a. have been used where it is considered that there may have been figures for that year but the records are lost to us.

b. In summing data for various tables the figure in the total column has often been much less than it should be since we do not have all the data. In such cases the final total figure is marked with an asterisk.

c. New South Wales for 1903 and Victoria for the years 1916 to 1930 did not record the exports of horses and the figures that appear in the Appendix I were derived by subtracting the totals of the other states from the figures given in the Commonwealth Export Bulletins.

d. The appendices are all constructed on the basis of data on a year by year basis. It was found impossible to develop any shorter periods of measurement for horse numbers, imports or exports since the figures were not generally available and there were few significant insights to be gained from quarterly data. Over the period recorded, the colonies and states adopted different conventions in determining the year of record. It has been the convention in these appendices to give, for the greater part of the time period, a rounded calendar year, except where Commonwealth figures are available. In these cases the tables are to be read in terms of financial years and when this has been adopted the difference has been noted in the table.
e. The statistics for all colonies (states), except Western Australia and Queensland, are as complete as possible but the writer was unable to spend the necessary time in Western Australia and Queensland that would have provided at least some further information for these areas. In some cases values were given for horse imports or exports without any figure for the actual number. It was judged to be misleading to attempt to make estimates from these few figures.

One area of data has proved impossible to unravel. The records of overland transfers from colony to colony cannot be reconciled and only the most tentative generalisations can be made about the net exchanges of horses between the colonies. The only reliable figures for inter colonial sales are where horses were transported by ship.

The appendices form a statistical record of the role of bullocks and horses in Australian history and while they are as complete as the writer was able to make them it is hoped that future scholars may be able to add to them.
## APPENDIX A: Livestock and Cultivation

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### Sources:

HRA; HRNSW; RETURNS OF THE COLONY.

\(^{(1)}\) Details are not available for the years that have been omitted. Blank columns indicate that the figures are not available.
## APPENDIX B: The Number of Cattle and Working Oxen in New South Wales 1788-1830.

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Source: HRA; HRNSW; RETURNS OF THE COLONY; CENSUS OF NEW SOUTH WALES, NOVEMBER 1828.

(1) Details are not available for the years that have been omitted.
Blank columns indicate that the figures are not available.
* Full figure not available.
APPENDIX C: The Number of Horses in New South Wales 1788-1830.

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Sources: HRA; HRNSW; RETURNS OF THE COLONY; CENSUS OF NEW SOUTH WALES, NOVEMBER 1828.

(1) Details are not available for the years that have been omitted. Blank columns indicate that the figures are not available.

* Full figure not available.
APPENDIX D: Price Range of Cattle and Working Bullocks
New South Wales, 1790-1830.

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Sources: HRA; HRNSW; Returns of the Colony; J. Atkinson, D. Collins, P. Cunningham, W.C. Wentworth; Sydney Gazette; Macarthur Papers, Second Collection, A4176 MS, ML; Australian Agricultural Company, Minutes of the Court of Directors 1824, 78/1/1-3; ANU Archives, Canberra.
### APPENDIX E: The Price Range of Horses, New South Wales 1788-1830

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Sources: HRA; HRNSW; Sydney Gazette; D. Collins; P. Cunningham; J. Atkinson; W.C. Wentworth; Macarthur Papers, MS, A4176, ML, Sydney; Australian Agricultural Company, Minutes of Directors, 78/1/1; Dispatches, 78/1/2, 78/1/3; ANU Archives, Canberra; B.H. Fletcher, op.cit., pp. 229-31.

(1) The sale prices of horses vary considerably for each type depending upon quality and appearance. The figures show the lower and upper ranges.

(2) A few notable stallions were valued in excess of £2,000.
## APPENDIX F: Australian Horse Trade, Gross Exports 1816 to 1860

(Includes both Inter-Colony and Foreign)

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## APPENDIX F: Australian Horse Trade, Gross Exports 1816 to 1860

(Includes both Inter-Colonial and Foreign)

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**APPENDIX F: Australian Horse Trade, Gross Exports 1816 to 1860**

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(1) There were no recorded exports for Queensland before 1860.

**Sources:**
HRA, Returns of the Colony and Statistical Registers of the Colonies.
### APPENDIX G: Australian Horse Exports to Foreign Countries, 1816 to 1860.
(Figures for exports clearly identified)

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Full value or number not available.

**Sources:** HRA; HRNSW; Returns of the Colony; Statistical Registers of the Colonies.
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** Totals as at December each year with the exceptions.
  a. As at 1 March each year from 1916.
  b. As at 30 June each year from 1914.
  c. As at 30 June each year from 1916.

**Sources:** HRA; HRNSW; Returns of the Colony; Statistical Registers; Commonwealth Year Book.
### APPENDIX I: Australian Horse Exports, 1861-1930/31.

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Sources: Statistical Registers; Commonwealth Year Books.

Total Horse Exports 1861-1930/31.

Total Exports As Per Registers

Horses Not Included

Boer War (1) 375 7500
World War One (2) 39348 815300

Grand Total 582606 11744246

(1) Victorian Statistical Register 1899.

(2) Commonwealth Year Book 1901-17, pp. 311-12; 1901-19, p. 322.
**APPENDIX J: Distribution of Horse Exports to Market Zones* 1861-1930/31.**

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*Market Zones

African: Cape Colony, Natal (Union of South Africa), Portuguese East Africa, German West Africa, Sudan, Mauritius, Reunion.
Indian: Calcutta, Madras, Bombay, Bengal, Ceylon, Burma.
S.E. Asia: Batavia, Indonesia, Indo-China, Straits Settlements, Thailand.
East Asia: China, Japan, Hong Kong, Guam, etc, Philippines.
Pacific: New Zealand, Fiji, New Caledonia, Papua and New Guinea, New Hebrides, South Sea Islands.
Europe, etc.: Britain, France, Germany, Russia, Canada, USA, Argentina, Chile.
Other: Foreign exports where destinations were not recorded.

Sources: Statistical Registers; Commonwealth Year Books.

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Sources: Statistical Registers; Commonwealth Year Books.
## APPENDIX L: Imports of Stud or Pure-bred Horses to Australia, 1820-1919.

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**Sources:** HRA; Returns of the Colony; Statistical returns of the various colonies to 1860; Statistical Registers 1860-1920.
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