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The Bicycle in Rural Australia:
A Study of Man, Machine and Milieu

James Douglas Fitzpatrick

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for the
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Except where acknowledged, this study
represents my original work.

James D. F. [Signature]

Abstract

The use of the bicycle in rural Australia represented a propitious and effective blending of man, machine and environment.

The pneumatic tyred safety bicycle was available in Australia by 1890; it was both imported and locally assembled.

The bicycle and tyres were strong, durable, lightweight, and easy to repair. They required little modification for use in rural Australia, although some ingenious adaptations were applied to preventing punctures and increasing cargo carrying capacity.

The terrain, vegetation and climate as well as political, economic, and social factors encouraged its widespread adoption. The machine did not require food or water nor did it eat poisonous plants. The highly energy-efficient cyclist was generally two to three times as fast as a pedestrian, horse or camel in most circumstances, whether on or off roads, and could carry up to 150 pounds (68 kilograms) of cargo in the process.

Its first significant use in rural areas was on the Western Australian goldfields from late 1893 and by 1900 cyclists had criss-crossed the continent. The bicycle was adopted in large numbers in eastern Australia from about 1900. It was used, among others, by shearers, pipeline and rabbit fence patrols, commercial travellers, professional men, and for mustering and droving, persisting in some of these roles until about 1960.

The machine's decline, from about 1920, was related to the introduction of the motor car; the motorcycle was not a significant factor in the transition.

The bicycle was responsible for the development of extensive touring, including alpine areas, and resulted in the first Australian road maps, touring guides and tourist organisations. The bicycle was a factor in plant dispersal. Its former use has raised some questions concerning the appropriateness of modern bicycle design and use in Australia.

Its low profile in the written record is explained by its utilitarian nature and its inability to compete in romantic appeal with the image of horse and man in the landscape that was emerging as part of the 'Australian Legend'.

The nature and extent of the rural Australian experience with the bicycle may be unique.

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Notes on Procedures

As this study focusses upon a period during which the British Imperial System of measure was used, and I have quoted many sources using such measures, I have used the Imperial System throughout, giving the International (Metric) System values in parentheses. However, to avoid awkward reading, I have not generally converted Imperial values within direct quotations.

All quotations have been reproduced exactly. Corrections and alterations of grammatical, syntactical or other errors have been made only where necessary for clarification, and these are always bracketed.

Referencing in this thesis is based upon the Harvard System. All references are listed alphabetically and by date at the end of the thesis by means of a key, generally the author's last name (e.g. Jones 1977). Where there is no author, an appropriate substitute key is used, usually abbreviated (e.g. a journal title, JDepAgWA, or newspaper name, SMH). All references cited by abbreviated keys are fully explained in the 'Sources' list.

The specific date and page number(s) of a reference are given in the text. For example, a reference to the Sydney Morning Herald of 17 December, 1895, page 6, is keyed in the text as (SMH 17/12/95:6); page 5 of the January, 1896 issue of the Austral Wheel as (AuWh 1/96:5). In these references all dates after 1878 have had the '18' or '19' deleted.

A further discussion of methodology and sources is given on page 351.

The following abbreviations are used:

°C	degrees Celsius
°F	degrees Fahrenheit
g	gram(s)
J	joule(s)
kg	kilogram(s)
km	kilometre(s)
kph	kilometre(s) per hour
lbs	pounds avoirdupois
m	metre(s)
mm	millimetre(s)
mph	mile(s) per hour
m/s	metre(s) per second
oz	ounce(s) avoirdupois
rpm	revolution(s) per minute

ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern Territory
QLD	Queensland
SA	South Australia
TAS	Tasmania
WA	Western Australia
VIC	Victoria

Chapter 1
INTRODUCTION

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I. Prologue

In retrospect, it is almost as if the bicycle and the rural Australian environment of the 1890s were made for one another.

The rural Australian milieu -- and the concept incorporates all physical and cultural aspects -- included many elements conducive to the adoption and use of the bicycle. The temperatures over most of Australia permit year-round riding. There are few streams to hamper movements through the interior. Much of the land was covered with vegetation -- both natural and modified by aborigines or Europeans -- which was amenable to bicycling. And of great importance, much of the continent is flat and lies at a low altitude.

The continent had been settled for a century by Europeans, mostly from the British Isles, who had subjugated or replaced the previous aboriginal inhabitants. The transported western society was wealthy and many individuals could afford the bicycle. It was a society influenced by the industrial revolution and inclined towards an acceptance of technology and technological change. A mechanical sense was an integral part of the culture.

Although much of Australia had been explored by 1890 there was little reason or incentive for dense settlement over more than a small proportion of it. The majority of the population was centred about a few coastal cities in the southeast. Outside the few inland towns of note, the continent was the province of sparsely distributed agriculturists, pastoralists, miners, and keepers of telegraph stations and government outposts. As a result there was a need for travel between widely spaced settlements and isolated homesteads.

There was considerable rural movement. Workers, such as shearers and prospectors, shifted about the various properties and mining centres,

and commercial travellers and others served the scattered population. The distances travelled were very large by world standards; in few other countries did people move so far as part of their regular work routines. There were no important political, linguistic or social barriers to movement. Only a few railway lines penetrated the interior, and inland water transport was limited to the Murray - Darling River system in the southeast. But the water flow was sporadic; even at best both it and the railway network left vast spaces to be crossed by other means: in the year 1890 that meant walking, riding a horse or horse-drawn vehicles, or (to a very minor extent) using a camel.

By 1890 the pneumatic-tyred safety bicycle (so named because it was much safer to ride than earlier models) had been introduced to Australia from England. The deceptively delicate-looking machine was, in many respects, a technological marvel. It encompassed some advanced technological innovations -- the ball bearing, tubular steel frame, roller bearing chain, tangentially spoked wheels, and pneumatic tyre -- all of which were invented during the course of cycle development. The bicycle was lightweight and proved strong, durable, reliable (including tyres) and capable of operating with a minimum of maintenance. As well, it was easy to learn to ride.

In rural Australia the bicycle proved to be a superb personal transport device. It needed neither a trial period nor modifications to suit 'Australian conditions'. And, although the product of some advanced manufacturing procedures any reasonably competent handyman could assemble and repair it. Of great importance for the bush traveller, the bicycle could function with makeshift repairs and if necessary, in many situations, without any at all. It did not eat poisonous plants and die, as did horses and camels, and the fact that it needed no food or water was no mean asset in drought-prone Australia. Its most remarkable characteristic

was that it allowed the rider to achieve a great physiological efficiency, and multiplied his power in the process of transmitting it. The result was that over long distances the cyclist was two or three times as fast as any alternative mode of transport (apart from trains) -- and he was not restricted to formed roads and tracks.

In these circumstances it is not surprising that the machine was widely adopted. It occupied a unique and important niche in rural Australian transport for three decades. This study describes that development, analyses the factors that contributed to it, and attempts to assess its impact.

II. Background

The broader context of the bicycle's mechanical evolution, use and social impact is well surveyed in Andrew Ritchie's (1975) King of the Road: An Illustrated History of Cycling. It includes the best collection of cycling illustrations ever assembled. C.F. Caunter's (1955) The History and Development of Cycles, prepared for the British Science Museum, is the standard reference on the technical evolution of the machine. The best study of the impact of the bicycle upon a particular society is Robert A. Smith's (1972) A Social History of the Bicycle: Its Early Life and Times in America. He examines the last decades of the nineteenth century, but concentrates upon the great cycle boom of the 1890s. Smith conveys an excellent feel for the era and traces the extent to which the machine influenced much of the nation's political, economic and social life.

Early Man-Powered Vehicles

'... the velocity of these carriages depends upon the activity of the manager'.

(Vevers 1769)

Although the development of an effective human-powered self-propelled wheeled vehicle is a relative latecomer technologically, some ideas were recorded several centuries ago. In 1418 a light four-wheeled vehicle, manually powered via ropes, pulley and gearing was designed by a Paduan (Caunter 1955:1). About 1493 a drawing of a bicycle (probably by a student of Leonardo da Vinci, but thought to have derived from Leonardo himself) anticipated the modern safety bicycle by four centuries (Marinoni 1974).

The earliest known machine to be constructed was built by a German coachmaker in the mid-seventeenth century, and was manually powered by two persons (Monconys 1665). By 1696 a coach was built in which one man provided leg power to the rear axle via a pair of treadles while a front passenger steered (Ozanam 1696). In 1761 an English model was demonstrated which was 'capable of travelling with ease six miles an hour, and by a particular exertion of the footman, might travel nine or ten miles an hour on a good road' (Universal 1761). A few years later Hooper (1774) commented that if the treadles were shifted to the front one man could simultaneously steer and power the device. His evaluation was that 'in a rough or deep road it must be attended with more pain than pleasure'. These early man-powered horseless carriages were generally confined to short demonstrations, but a French inventor, Blanchard, reportedly travelled from Paris to Versailles, a distance of about 14 miles (22 km) in 1 3/4 hours (de Saugnier 1935).

The Hobby-horse or Draisienne

'This machine can never be of any real utility ...'

(Le Petite Chronique de Paris 7/4/1818
-- cited in Ritchie 1975:18)

In 1788 the Comte de Sivrac demonstrated the 'célerifère', the forerunner of the bicycle, at the Palais-Royal in France (Caunter 1955:2). The machine consisted of two wheels connected by a stiff frame member, and was propelled by the rider pushing his feet against the ground while seated astride (Figure 1.1). It could not be steered and had no practical use. By 1817, however, the Baron von Drais de Sauerbrun, of Mannerheim, had modified the design to include a padded seat and armrest for more comfort and better leverage when pushing, and a steerable front wheel (Figure 1.2). As 'Master of the Woods and Forests' (Duncan 1926a:277) he completed numerous journeys on rural roads, doing one 23 mile (37 km) trip in 2½ hours (Caunter 1955:3). Ackerman (1819) noted that

A person who has made himself tolerably well acquainted with the management of one can, without difficulty, urge himself forward at the rate of eight, nine or even ten miles an hour. In one account we are informed that experiments have shown it to be easy to travel fifty miles a day on these German hobbies.

The machine elicited many reactions that were to accompany subsequent cycling developments: it drew scorn, ridicule, satire, parody, and denouncement, or was simply ignored. However one Englishman (GenMag 1819) listed several advantages if the machines were widely adopted: they would release land devoted to keeping horses, could provide transport between communities in medical emergencies, and would mean increased mobility for those unable to afford horses. A modified draisienne was introduced into the French postal service in 1830 and some rural mailmen mounted them, but the experiment was stopped by a bad winter season (Caunter 1955:4). By this time the machines had gone out of favour.

Figure 1.1
A CELERIFERE, 1793
(Woodforde 1970:8)



Figure 1.2
A DRAISIENNE OR HOBBY-HORSE, 1819
(Woodforde 1970:10)

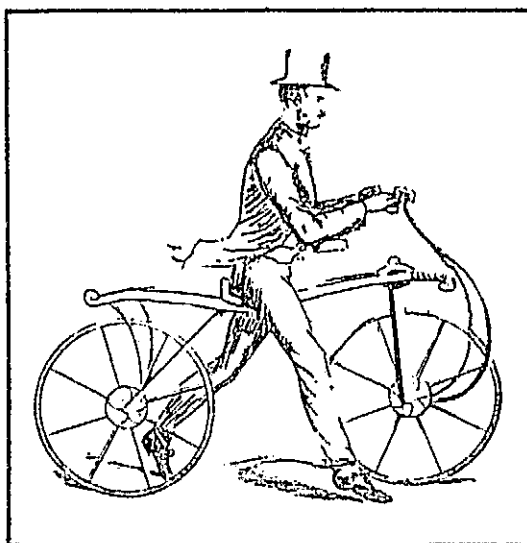
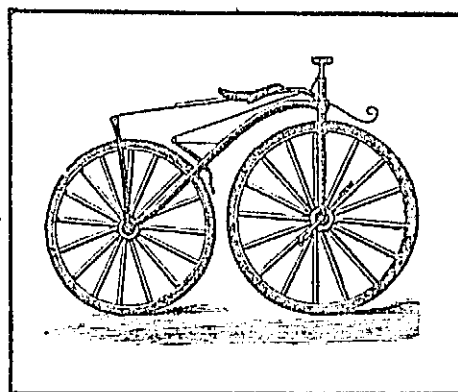


Figure 1.3
A MICHAUX VELOCIPÈDE, 1865
(Woodforde 1970:20)



The machines had several drawbacks: they were heavy; the small iron-shod wooden wheels transmitted vibrations and shock; the riding position was not comfortable (nor at all efficient in utilising leg power); and mechanically they were poorly developed. In some respects they were not an advance at all, representing merely an assemblage of components that had long existed. But the confirmation that a man could balance and steer a device with tandemly aligned wheels was significant. The draisienne and horseless carriages represented two development streams that eventually led to a large variety of human powered road vehicles: monocycles, bicycles, dicycles, tricycles, quadricycles, and pentacycles.

* * *

Until the 1860s cycle developments proceeded sporadically. About 1840, in Scotland, Kirkpatrick MacMillan built a forerunner to the modern safety bicycle. The technical details are unclear, but it was apparently driven by a treadle and crank arrangement delivering power to the rear wheel. He used the machine for some years to travel about the countryside and on one occasion rode 40 miles (64 km) in five hours (Ritchie 1975:36-37). Quadricycles powered by treadles and cranks were sold commercially from about 1850 by Willard Sawyer of Kent (Ritchie 1975:39-46). Rides of 60 and 70 miles (96 and 113 km) in one day were accomplished, despite the fact that the machines had to be pushed up hills and steering them at speed required the 'greatest attention' (Wilcox 1869). Thomson patented the pneumatic tyre in 1846 and successfully tested a prototype on a carriage in a London park. The techniques of rubber manufacture did not allow practical production at the time and the matter was subsequently forgotten until after Dunlop's re-invention of the pneumatic tyre in 1888 (Duncan 1926b:599-602).

The Velocipede

'The art of walking is obsolete'.

(Scientific American 9/1/1869 --
cited in Ritchie 1975:63)

Pedals were fitted to the front wheel of a draisienne in France sometime between 1861 and 1863. The resultant velocipede (Figure 1.3) initiated the modern cycle industry and led to a minor craze that swept England, the United States and France during the last years of the decade. The word 'bicycle', used at least by September, 1868 (Oxford 1970), emanated from this era. The first cycle journal, Le Vélocipède Illustré (Caunter 1955:9), was founded in Grenoble in 1869, followed quickly by The Velocipedist (Oliver 1974:7) in the United States. Books on the machine's history and how to ride it were published in the United States (Goddard 1869), France (Lesclide 1869), and England (Bottomley 1869; Spencer 1870).

The highly efficient technique of using the legs to power the machine via a rotating crank and pedal arrangement was a major development in technological history. 'One can believe, with the benefit of hindsight, that so obvious a system as pedals and cranks must have been used for muscle power applications before the advent of the bicycle,' writes Professor David G. Wilson (1977a:20) of the Department of Mechanical Engineering, Massachusetts Institute of Technology, 'but I have been able to find no record of them'. Numerous other inventions improved the machine's rideability. Saddles and pedals were cushioned with rubber, and the first United States velocipede patent, in 1866, included a sprung saddle (Oliver 1974:5). In July, 1868 an American patent for adjustable pedals and seat included a suggestion that 'rubber rings' be used on the rims to make them noiseless and non-slipping (Oliver 1974:5-6). Four

months later, in England, the first rubber tyred bicycle was tested on snow covered roads (Caunter 1955:11). Handlebars were widened for better leverage, and some machines were lightened by the use of structural metal frames, including tubular members. Although crude wire spoke wheels were developed in 1866 (Caunter 1955:11), most machines used wooden spokes and rims with iron tyres, and consequently weighed at least 50 pounds (23 kg). By 1870 the seat was moved forward, placing the rider more nearly atop the front wheel, a much more comfortable and efficient position. Additional developments, while not common on velocipedes, included ball bearings, a primitive freewheel, and a two-speed gear. Steam engines were experimentally fitted to velocipedes in late 1868 in England (Caunter 1955:12) and about 1869 in the United States (Oliver 1974:38-39).

Speeds were not great and distances of 30 miles (48 km) in a day were considered good, but it was not unknown for 50 miles (80 km) to be covered by fit riders. In the first road race, from Paris to Rouen in 1869, 76 miles (123 km) were ridden in 10 hours and 45 minutes (Ritchie 1975:59-60). With the outbreak of the Franco-Prussian War the French gave thought to the bicycle's military potential (Caunter 1955:10).

The velocipede posed problems, however. It scared horses, and because of the bad roads riders frequently took to the smoother footpaths; this resulted in complaints, fines and laws against the practice. A great hindrance to the machine's effective use was the relatively small diameter wheels. As the smoothness of a ride is directly related to the diameter of the wheel (see Chapter 4 for details), they proved very uncomfortable on rough surfaces; the appellation of 'boneshaker' was explicit and appropriate. Also the rider had to pedal very quickly to maintain a reasonable speed. A 36 inch (91 cm) diameter wheel, common on velocipedes, represents a very low gear ratio (slightly lower than the lowest gear commonly found on the modern ten-speed bicycle). For

the rider to maintain even a ten mile an hour (16 kph) pace required a very fast pedalling rate of 93 revolutions per minute, neither comfortable nor physiologically efficient. A gentle gradient allowing a speed of 18 miles per hour (29 kph) resulted in nearly impossible pedalling rates of 168 revolutions per minute.

The velocipede was not conducive to long, fast or pleasant rides, and the craze of the late 1860s collapsed about 1870. There was no significant impact on rural travellers. The important contribution of the machine was the development of a cycle industry, in which a few saw the potential of personally powered mechanical mobility and devoted themselves to improving the concept.

The Ordinary

'Bicyclists are become a power ... They have attained the speed of a horse ...'

(The London Times 5/9/1878 -- cited in Ritchie 1975:85)

The problem of the velocipede's low speed and rough ride was solved partly by increasing the diameter of the front wheel. Whereas a 36 inch (91 cm) diameter wheel required 93 revolutions per minute to maintain a ten mile an hour (16 kph) speed, a 60 inch (152 cm) diameter wheel required only 56 revolutions per minute; and the larger wheel gave a more comfortable ride. Although some bicycles with 60 inch (152 cm) diameter wheels were used, the majority were about 50 to 55 inches (127 to 140 cm) in diameter. As the driving wheels became larger the rear wheel was decreased to same weight; the result was the 'ordinary' or 'penny-farthing' (Figure 1.4). Originally the machines were called bicycles, but as 'safety' bicycles were developed it became necessary to differentiate between the various styles, hence the use of the terms 'penny-farthing' and 'ordinary' (Ritchie 1975:79-80).

Figure 1.4
AN ORDINARY
(Alderson 1972:3)

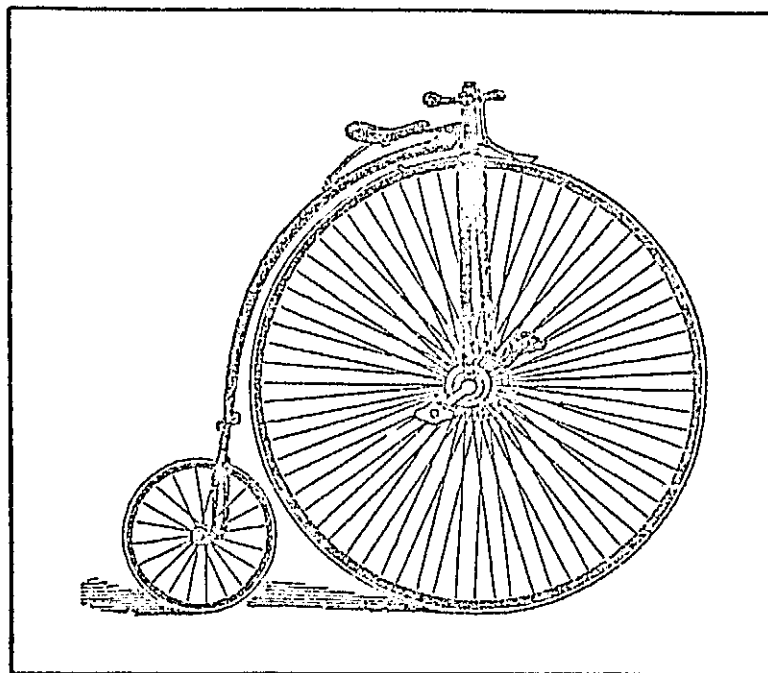
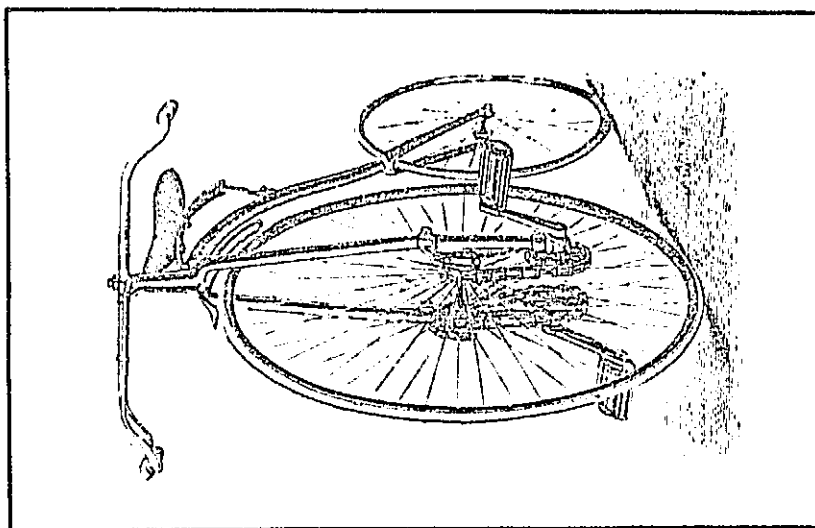


Figure 1.5
A 'DWARF' SAFETY: THE 'KANGAROO', 1885
(Woodforde 1970:62)



The ordinary machines quickly replaced the velocipedes after 1870. The larger wheels were possible because they used light, tensioned wire spokes, first practically applied to the bicycle in 1869 (Caunter 1955: 14). By 1875 other technical developments included all metal frames (including hollow front forks), hollow (cushion) rubber tyres, and Grout's invention for the accurate tensioning of spokes, which permitted the realignment or 'truing' of wheels. By 1880 ball and roller bearings were used and a variety of saddles had been developed: shaped metal seats suspended on metal leaf springs, cane and webbing seats, and the more common rubber and leather ones (Caunter 1955:14-15).

Ordinaries were widely used in the 1880s in several western countries. A number were also introduced to various non-western societies, such as Japan in 1881 (Uyeda 1936). Simultaneously a wide variety of multi-wheeled machines, particularly the tricycle, came into use. The net result was a surge of cycling activities and the founding of numerous cycle clubs and journals. Books were written on the general history and techniques of cycling (e.g. Tinsley 1874; Pratt 1880; Bury 1887) as well as more specialised aspects such as tricycling (Hoffman 1887) and ladies' tricycling (Erskine 1884). Griffin's (1886) Bicycles and Tricycles of the Year 1886 catalogues the bewildering array of machines then available.

The ordinaries were fast. By 1874 a rider had covered 106 miles (171 km) in under eight hours. In 1873 riders rode approximately 800 miles (1,287 km) from London to John-o'-Groats in 14 days; the Daily Telegraph responded by stating that 'To say that the work would tire a horse is a feeble description of it. The strongest horse would break down under such a journey' (Ritchie 1975:96-97). By 1879 the mile had been ridden in less than three minutes and distances of over 250 miles (402 km) in one day and 1,170 miles (1,882 km) in six days had been

accomplished (Caunter 1955:24).

The ordinary provided a relatively rapid means of exploring the countryside free from railway routes and schedules. Many of the coaching roads in England, for example, which had been all but abandoned by through traffic after the introduction of railways, furnished some superb cycling opportunities:

The loneliness of those roads is past all belief to those who never cycled over them and only know the whirl of traffic that congests the highways today (Ritchie 1975:82).

But problems resulted from the lack of road maps or signposts and the absence of any knowledge of local surface conditions. Also, the machines scared horses and the cyclists were occasionally attacked by dogs, local residents and teamsters. Some intrepid souls attempted global rides, among them Thomas Beelen, who set out from San Francisco on a 50 inch (127 cm) machine and rode around the world in three years (Smith 1972: 127-128).

The widespread use of the machines for rural travel was restricted by several factors. For one, they were hard to mount, and once aboard, the precarious perch could be very dangerous. When hitting an obstacle the rider was likely to be thrown over the handlebars and some died from the 'headers'. The solid rubber or cushion rubber tyres, being relatively stiff and unyielding, had a tendency to come off the rims when subjected to lateral or twisting forces. Though the machines were more comfortable and provided less rolling resistance than the velocipedes, they still required considerable effort to pedal on rough or soft surfaces. The lack of brakes (and the relative ineffectiveness of many that were fitted) made the machines less than ideal for steep slopes; 'a little guy on a fifty-inch wheel had to pedal very fast to keep up with himself' (Ritchie 1975:99).

After surveying the literature my reaction is that the ordinary was used mostly for sporting purposes and touring by urban residents; it had little direct effect in improving transport matters for rural residents. However, there were some indirect and delayed results that were important. The high-wheelers were the focus of cycle clubs and organisations which brought considerable pressure to bear upon various authorities for better roads and signposting, although positive results were not generally seen until the safety era. In the United States, the state of New Jersey legislated state aid for road construction in 1891. Passage was significantly influenced by the cycle lobby, particularly the League of American Wheelmen, which was subsidised by cycle manufacturers. Within a few years some of the local residents felt that the upgraded roads had improved farm values, decreased the number of animals needed to haul goods to market, and would aid in hurrying the provision of free rural delivery of mail (Smith 1972:205-225). In both the United States and Europe, cyclists reportedly benefitted the innkeepers. Tricycles and bicycles were adopted for some urban mail and parcel delivery, but it is not clear if they were used in rural areas and small communities.

Most importantly, the ordinaries had shown that properly designed human powered machines could provide rapid personal transport under suitable conditions. For rural travellers the need was for a cheap bicycle that could operate under a wide variety of riding conditions. The ordinaries provided the needed impetus for inventors and manufacturers.

The Safety

'Here, indeed is safety guaranteed, and the cyclist may ride roughshod over hedges, ditches and similar obstacles without the fear of going over the handles ...'

(Cyclist 21/4/1880 -- cited in
Ritchie 1975:124)

Even while ordinaries were being improved upon, cycle builders were developing other varieties that could be ridden with greater ease and safety. There were two streams of experimentation. One group concentrated upon the existing front wheel drive machines, designing gearing arrangements that allowed the size of the wheel to be reduced while the gear ratio remained high. Also the seat was moved back to lessen the incidence of 'headers'. The culmination was a series of lower, more stable bicycles known collectively as 'dwarf' safeties, notable among them being the 'Kangaroo' (Figure 1.5), 'Xtraordinary' and 'Facile'. They still resembled the high wheelers, however, having only a single frame member to connect the unequal-sized wheels.

Another series of developments resulted in the creation of rear wheel driven bicycles. (A Frenchman reportedly built a machine driven via the rear wheel in 1868 or 1869, but the facts are questionable and cycle historians are doubtful (Caunter, 1955; Ritchie 1975)). A bicycle powered via the rear wheel was constructed in England by Henry Lawson in 1873-1874. In 1879 he produced his third model, the 'Bicyclette' (Figure 1.6), a 'cross' frame design with a larger front wheel than rear, and indirect steering. With its chain and cog drive and low seating position between the wheels, it is considered the first practical, commercial forerunner to the modern safety bicycle. In 1885 John K. Starley built a bicycle based upon the diamond frame concept (Figure 1.7). His third model is accepted as the 'production prototype' of the present safety bicycle (Caunter 1955:35). Developments culminated in the Humber pattern of 1890 (Plate 4.3). It had ball bearings in a raked steering and set fork (a 'set' fork is one that is bent forward at the bottom, a crucial factor in effective steering and balancing (BBC 1973)); a chain drive to the rear wheel, with an adjustable rear wheel position for chain tensioning; light, spoked wheels; an adjustable sprung saddle; wheels nearly the

Figure 1.6
HENRY LAWSON'S 'BICYCLETTE', 1879
(Woodforde 1970:94)

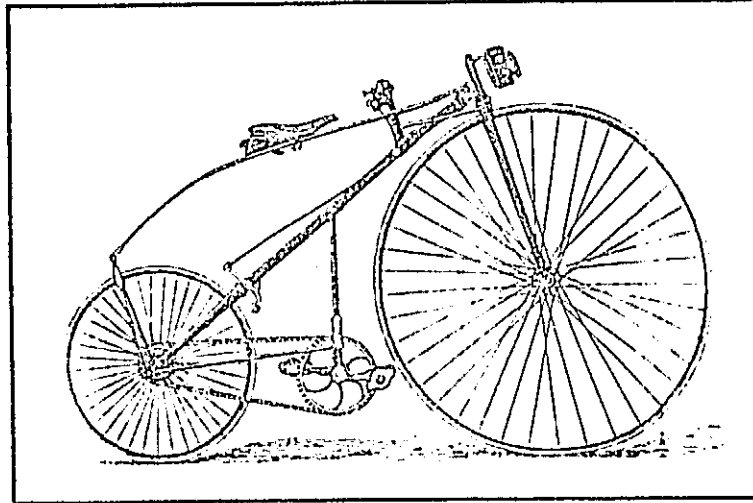
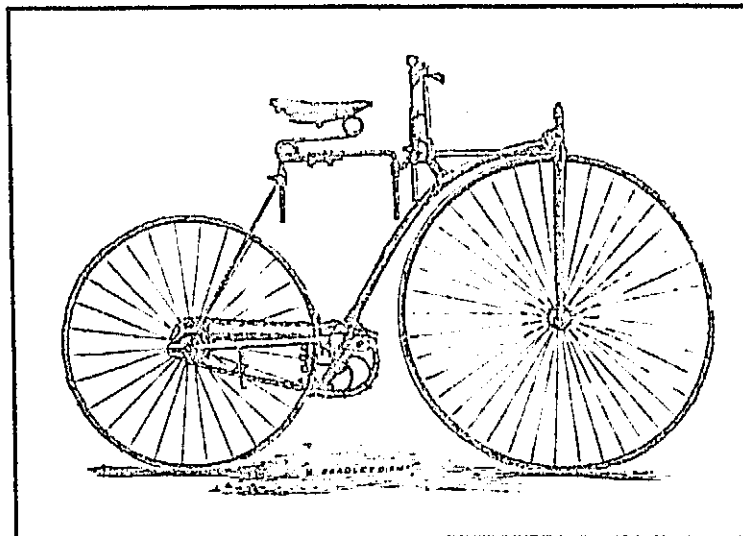


Figure 1.7
JOHN K. STARLEY'S FIRST 'ROVER', 1885
(Woodforde 1970:96)



same diameter (28 inch (71 cm) rear and 30 inch (76 cm) front); and a completely triangulated frame, with saddle pillar. The design has been used to the present day for the vast majority of bicycles. (Henceforth the terms 'safety' and 'bicycle' refer only to the modern safety bicycle, unless otherwise qualified).

For ease of riding, the safety was a great improvement. The rider could mount and sit stationary with no difficulty. In motion the machine was more stable than the high wheelers. The independently steered front wheel eliminated the inconvenience of pedalling a steering wheel. The seating position decreased the likelihood of 'headers'. The small wheels did mean a rougher ride but this problem was partially alleviated by the widespread use of cushion rubber tyres and effectively eliminated with the advent of pneumatic tyres in 1888. For a while the 'dwarf' safeties and the rear-driven diamond frame models competed for popularity. Ultimately the mechanical, structural and rideability advantages of the Humber pattern proved far superior and commercial interests quickly swung in that direction. By 1890 the days of the ordinaries and 'dwarfs' were numbered; the diamond frame safety dominated the cycling world.

The speed of the bicycle greatly enhanced personal mobility. The fastest long distance horse ride on record covered only 300 miles (483 km) in 52½ hours, a rate of 5.7 miles per hour (9 kph) (McWhirter 1977:286); by 1898 a cyclist had ridden 428 miles (689 km) in only 24 hours, a rate of 17.8 miles per hour (29 kph) (Ritchie 1975:142). In 1831 one man used 50 horses in relay to ride 200 miles (322 km) in eight hours and 42 minutes, a rate of 23.0 miles per hour (37.0 kph) (McWhirter 1977:286). Yet this is 0.4 miles per hour (0.6 kph) slower than the rate maintained by a solo cyclist over a 12 hour period (McWhirter 1977:264). Of far more importance to the common man, however, was the fact that distances of 50 to 75 miles (80 to 121 km) in a day were readily achieved on a bicycle,

and 100 miles (161 km) was not at all unusual. It meant that on many routes individuals were able to travel much farther at a faster rate than ever before, and as prices dropped and output increased, progressively more and more people gained access to that increased mobility.

The safety proved a landmark in the history of personal mobility. It resulted in a cycling boom of unexpected proportions. By 1900, millions had been manufactured. New bicycle prices had fallen to the equivalent of several weeks' wages, and used machines could be had for considerably less, and extended purchase schemes were available. The ultimate effects of the bicycle have yet to be properly assessed, although Aronson (1952), Harmond (1971), Smith (1972) and Ritchie (1975) have suggested something of its impact upon the development of manufacturing techniques and its role in altering social and economic patterns.

In addition to the seemingly endless number of cycling columns and articles in newspapers, journals and magazines, there were numerous books on a variety of social, technical, historical and instructional matters, such as by Porter (1892) in the United States and Bury (1891), Griffin (1890), Pemberton (1897) and Sturmey (1898) in the United Kingdom. H.G. Wells (1898) turned his talents to assessing the machine's potential for lowering social class barriers in England. Bowden (1890) wrote on the relationship between good health and cycling, while Herschell (1896) focussed upon the relationship between cycling and heart disease. Important for my research was the work of several who discussed the technical aspects of cycling. Wallis (1897) produced a detailed workshop manual and Garratt's (1897) The Modern Safety Bicycle treated construction and riding theory in great detail. Scott's (1889) Cycling Art, Energy and Locomotion was a forerunner to Sharp's (1896) work Bicycles and Tricycles, which considered the machine's design and construction and the basic physics, mechanics, and physiology of riding. No similar effort was

again published for nearly 80 years. Australian cycle journals and books will be discussed at appropriate places in the text, especially the introductions to Chapters 5 and 6.

The Safety Bicycle in Rural Areas

Some aspects of the bicycle's impact upon United States and European rural areas, such as increased income for local innkeepers and the improvement of roads, have already been suggested. However, little has been written about the direct use of the machine by rural dwellers and workers. Smith (1972), for example, rarely mentions the use of bicycles in rural America, aside from urban tourers. In response to an inquiry about the importance of the bicycle among rural Americans, he offered the following comments:

For the most part during the late 19th Century the bicycle appears to have been confined largely to urban areas where its use was both recreational and vocational. I did find it mentioned in small rural weekly newspapers and found photographs of the machine in country settings. However, my opinion is that it was essentially an urban phenomenon, particularly from the standpoint of cheap transportation.

This opinion is based on the following. One, the rural roads in the United States were abominable and hardly fit for wheeled traffic except for wagons pulled by teams of horses. This situation was not materially changed until the advent of the automobile and major road building came after 1920 with the help of the federal government. Where rural roads had been improved by grading they were frequently rendered impassable by the generally heavy rains of the summer months throughout much of the nation. (cf. the limited rainfall of the Outback.)

Second, the advent of the bicycle coincided with the greatest outburst of railroad building in our history and every town in the country, regardless of size, did all it could to achieve a place in the network. As a result, the construction of good roads between the towns and cities languished because it was cheaper and faster to go by the train. Rural roads then sank back to being mere "feeders" for the farm population in the immediate vicinity of the towns. This rail structure was further augmented by the building of electric railroads, generally called "inter-urbans", whose name alone conveys their function.

Finally, the coming of the automobile ushered in the United States' well-known love affair with the internal combustion engine. Although the automobile was never as cheap as the bicycle it had much more prestige and the riding of cycles by adults became a thing of the past. My father-in-law rode a bicycle to work during the Great Depression of the Thirties and, despite the obvious savings, was looked upon as something of an eccentric (Smith 1976).

Certainly much of Smith's reasoning as to why bicycles were not heavily used in rural America appears to be sound. On the other hand, it is possible that the bicycle was in fact used more in rural areas than he realises, but his research materials were not varied enough to adequately assess it. For example, his bibliography indicates that he relied principally upon 15 books, nine newspapers (three from New York, and one each from Atlanta, Boston, Chicago, Los Angeles, Minneapolis, and Riverside (California) -- all large cities, except the latter), and a limited number of magazines, mostly published in New York (Harper's Weekly, Harper's Monthly, Scientific American, and Scribner's account for 67 percent of cited articles). Had I restricted myself to the Australian equivalent of Smith's materials, this study could not have been carried out; it was only by using newspapers from many small communities, extensive oral interviews and personal correspondence, diaries, published reminiscences, and government records that the nature and extent of rural Australian cycling could be portrayed and understood.

This point was corroborated by discussions with Indian (1978), who is conducting a study of leisure activities, including cycling, in Melbourne during the Victorian era. She has perused materials of a nature similar to Smith's; while she encountered occasional references to the bicycle's outback use, especially in Western Australia, she did not appreciate the extent or significance of that use. Dunstan's (1973) brief chapter on the bicycle in Australia, based upon materials similar to Indian's and Smith's, never mentions the use of the bicycle in rural

areas. In a personal interview Dunstan (1976a) indicated that he was unaware that the machine had been used extensively for rural work and travel in Australia. That the rural use of the bicycle has not been discussed by most writers of cycling (or transport) history is most likely a reflection of the lack of appropriately focussed research.

The machine's impact in rural areas has, in some respects, been very subtle -- even the parameters have yet to be adequately defined, let alone measured; an excellent example is provided by Perry (1969) in his study of 'Working Class Isolation and Mobility in Rural Dorset, 1837-1936; A Study of Marriage Distances'. He found a great increase in inter-parish marriages during the last 15 years of the nineteenth century. It resulted from a variety of factors, including increased wages, shorter working hours and widespread rail facilities. But, as Perry points out, the trains and local vans and carts were too expensive for general local use; foot travel was the norm. After a long working day he who 'had the energy to walk 5 or 6 miles regularly must have been an exception. It was this situation', he suggests, 'that the bicycle, inter alia, transformed, although exactly how and when remains uncertain' (p. 134); historical data does not allow an assessment of the extent to which workers utilised the machine nor the nature of their riding patterns. Perry feels that 'the advent of the bicycle may be regarded as the key factor in this rural revolution' (p. 134) which freed the working class from the severe travel restrictions that previously prevailed.

Writing in the New Scientist six years later, Ryan (1975:419) noted this 'major contribution to the genetic health of rural Britain'. Whereas the rural worker's previous access to 'fertile women was limited by the distance he could walk around his native village and still have the strength left to impregnate them', with the coming of the bicycle 'the lucky owner was enabled to put it about for miles around, particularly

if he lived at the top of a hill'. Ryan's tongue-in-cheek attitude was preliminary to introducing the concept of the bicycle as a 'salubrious male contraceptive', derived from a recent report in the British Medical Journal, cited by Ryan. As overheating can kill sperm, a doctor advised a married man who cycled 2½ hours daily to abandon the machine for a while to solve the couple's infertility problem; the advice was taken and conception occurred. The concept of two-wheeled gene dispersal was recognised and given academic credence and publicity 80 years after the event.

The bicycle's main areas of use were initially North America and northwestern Europe. By 1895 the machines and components were being exported around the world in large numbers when first the United States and then the United Kingdom sought additional markets for their increasing production. The bicycle was subsequently found to be an effective transport device in a wide variety of rural conditions. For example, at the conclusion of a journey through East Africa, Winston Churchill (1908: 137-138) wrote that

the best of all methods of progression in Central Africa -- however astonishing it may seem -- is the bicycle ... From my own experience I should suppose that with a bicycle twenty-five to thirty miles a day could regularly be covered in Uganda, and, if only the porters could keep up, all journeys could be nearly trebled, and every white officer's radius of action proportionately increased.

Nearly all the British officers I met already possessed and used bicycles, and even the native chiefs are beginning to acquire them. But what is needed to make the plan effective is a good system of strong, fumigated insect-proof rest-houses at stages of thirty miles on all the main lines of communications.

Other cyclists had already used the machine for long rides in East Africa. In 1897 R.L.D. Macallister, a Vice-Consul of the Uganda Protectorate, had pedalled from Lake Victoria to the Indian Ocean, and a missionary rode

from the coast to Kampala in about three weeks (MorHer 22/6/97:2).

Leonard Woolf (1961) used the bicycle on many occasions during his years in the Ceylon Civil Service early this century. From Jaffna, on the north coast, he cycled about his daily business, sometimes accompanied by the police. After one 35 mile (56 km) journey from town he returned via a coastal road. The track eventually disappeared and he had to carry his machine across a dried lagoon and later push it through rice paddies. He reached Jaffna at seven that night, 'scorched, aching, and sore' (p. 78) from his 70 mile (113 km) trip. In 1911, during preparations for a census, an intense competition developed between the various Assistant Government Administrators to see who could first report their tallies. Woolf won by organising a bicycle relay network in his district to pedal in the returns. On another occasion

I climbed by a rocky track to the top of the mountain, a coolie carrying my bag and bicycle, and then ... I tipped the coolie, tied my bag to my bicycle, and coasted mile after mile down through the deliciously cool fresh mountain country until I reached the plain (p. 156).

The differences in timing of the widespread adoption of the bicycle in rural areas of various countries, and the reasons for these differences, remain intriguing questions. The rate of adoption has certainly varied. Woolf's and Churchill's accounts suggest the machine was not a popular tool in East Africa and Ceylon in 1910. My own observations indicate that the bicycle is not yet a significant element of rural (or urban) transport in El Salvador or Guatemala, for example. On the other hand the machine is used extensively for urban commuting and delivery of messages and goods in some South African and Rhodesian cities, especially Salisbury; in the latter are located the best and most intensively used bicycle paths I have seen outside western Europe. Hardwick (1975:82) indicates that in 1969 21 percent of the 65,000 daily commuters from Salisbury's African

townships used a bicycle. Yet, my own observations suggested that it was not a significant form of transport in the countryside.

Knight (1974), in a study of the Mbozi area of southwestern Tanzania, reports that bicycles and radios are 'no longer simply items of conspicuous consumption', but are part of a complex of items providing 'increased accessibility to new ideas' (pp. 188-190). That accessibility does not come cheaply, however: for a 'typical Nyiha family' selling crops and labor, the cost of a bicycle 'represents more than a year's cash income' (p. 190) and an annual government tax must be paid in addition to normal maintenance costs (p. 214). Nonetheless the bicycle is a particularly important focus for large scale spending in the area. It 'increases accessibility, resulting in continued exposure to new ideas -- both for making money (new crops or techniques of production) and spending it. At the same time it may make entering the labor market possible since travel time to a distant job becomes reasonable' (pp. 208-209). Knight's graphs suggest that the bicycle has become important only since 1955.

In distinct contrast to much of Latin America and Africa, the bicycle has been intensively used for many decades in south and south-eastern Asia and Japan. Anyone at all familiar with the Asian scene, urban or rural, can not help but be aware of the extensive use made of bicycles, tricycles, pedicabs, and similar transport devices employing human power. In a study of 66 irrigation communities in Taiwan, Young (1975) found the machines used in all of them. China is often cited as the premier example of a bicycle society; the Peking Review (26/3/76:24) reported that by 1974 over 50 million bicycles were in use in the country. However, India probably has more in use and I suspect they have been more important to the economy over the decades than in China. I am unaware of any study that has reported details of Indian cycle usage, although local bicycle manufacturing has been briefly considered (UN 1969).

During the planning of Japan's invasion of Malaya and Singapore Tsuji (1960) incorporated bicycles into his transport scheme for moving soldiers southward along the Malayan Peninsula. He denies Churchill's (1951:37) claim that the Japanese had previously 'hidden reserves of bicycles' on the peninsula. The Japanese had been shipping large numbers of bicycles to various Asian countries for many years prior to the war (they were accused of dumping) and had been using them in their own country on a large scale (Uyeda 1936); Tsuji knew that the machines were common (also see Chapman 1949) and that spare parts and replacements could be obtained on the Peninsula for the bicycles brought with the Japanese attack force. The use made of the bicycle by the Vietnamese in very difficult terrain during the Dien Bien Phu attack, and later against the Americans and their allies, has been mentioned by many (Elliott 1967; McGonagle 1968; BBC 1973). The Vietnamese, like the Japanese, were familiar with the ability of the bicyclist to operate effectively in harsh country.

Recent Research

For several decades after the turn of the century there were only sporadic studies of the use and development of the bicycle. Duncan (1926a, 1926b) produced an excellent historical summary of the bicycle and pneumatic tyre. In 1952 Aronson reviewed the 1890s cycle craze in the United States from a sociologist's perspective and in 1955 Caunter's work was published. The general history of cycling (Palmer 1956; McGonagle 1968), a biography of the Starleys of Coventry (Williamson 1966), and a brief statement of the machine's place in the broad scheme of technological history (Field 1958; Forbes 1958) are examples of the range and extent of material published until 1970.

In the present decade in western societies there has been a

resurgence of interest in the use of bicycles. Americans bought 58 million machines in a recent five-year period (FreeAus 7/78:14). In Australia 798,000 bicycles were sold from mid-1973 to mid-1976 (HsRepCt 1978:26), its biggest sales boom ever, and similar situations are being experienced in many European countries. Such sales have resulted partly because many in those countries feel there is a need to find alternatives to the high energy- and resource-consuming nature of their current lifestyle, best exemplified by the transport structure. For many people the bicycle is both a symbolic and a practical alternative. But whether or not the owners of those machines are using them to alleviate transport problems to any significant extent is a question that can be debated long and heatedly. Certainly prestige, status and 'trendiness' are keys to much of the sales explosion (Louis 1974; BBC 1973).

One result has been a veritable flood of cycling literature. It includes general cycling histories of varying nature and quality (e.g. Alderson 1972; Harmond 1971; Woodforde 1970 (reviewed by Fitzpatrick 1977m); Oliver 1974; Rennert 1973), academic works on technical and energy matters (Hirst 1974a, 1974b and many others referred to in detail later in this study), and uncountable books and articles on do-it-yourself cycling, repairing, touring, ad infinitum (e.g. Ballatine 1975; Burden 1973; Sloane 1970).

The most notable concentration of published literature and unpublished reports (and among the greatest gaps prior to 1970) has been in the realm of designing and implementing bicycle networks for existing automobile-oriented transport systems (e.g. Ashton 1974; Everett 1973; Fitzpatrick 1973a, 1973b; Hamill 1973; Parker 1977; Smith 1974; TRB 1976; Trevalyan 1975). The material through 1974 has been reasonably well surveyed for Canberra's National Capital Development Commission (NCDC 1975). Intriguingly, despite the fact that some European cities

have long been exemplary in their integration of the bicycle with motor vehicles, relatively little research or professional planning work had been published by or about them. A survey of the European situation was prepared by Fee (1974) for the United States Department of Transportation as a result of American curiosity.

Overall, however, there is a very noticeable gap in cycling literature: while authors often briefly note the widespread use of the bicycle in developing countries, there is a paucity of significant descriptions or analyses of that use. Behrman (1973) and Illich (1973, 1974) have devoted some attention to the role of the bicycle in various societies, both in terms of energy use and the machine's social implications. As well, some researchers have designed machines for use in developing countries; Stuart Wilson's (1977) Ox-Trike is adaptable to both passenger and cargo transport and is intended for easy local manufacture. But few others suggest the possibilities of research and lessons to be learned from studying developing countries' cycle usage.

As Whitt (1974:205) points out, bicycle use is generally under less than optimum conditions for most of the world's cyclists. The machines used in developing countries are different from those of North America and western Europe; a cursory glance at representative examples (Plates 1.1 and 1.2) demonstrates this. But aside from obvious appearances, there are numerous questions about the nature and extent of the differences. And as Whitt also frequently reiterates, little is known, either experimentally or empirically, concerning the performance of bicycles and riders in poor riding conditions. In this regard much of the current research into cycling matters is not beneficial to cyclists of developing countries, where tens of millions depend upon the machines each day.

I am convinced that the benefits of such research will be mutual.

Plate 1.1
A CHINESE 'PHOENIX'
(CNL 1972:SPB 15)

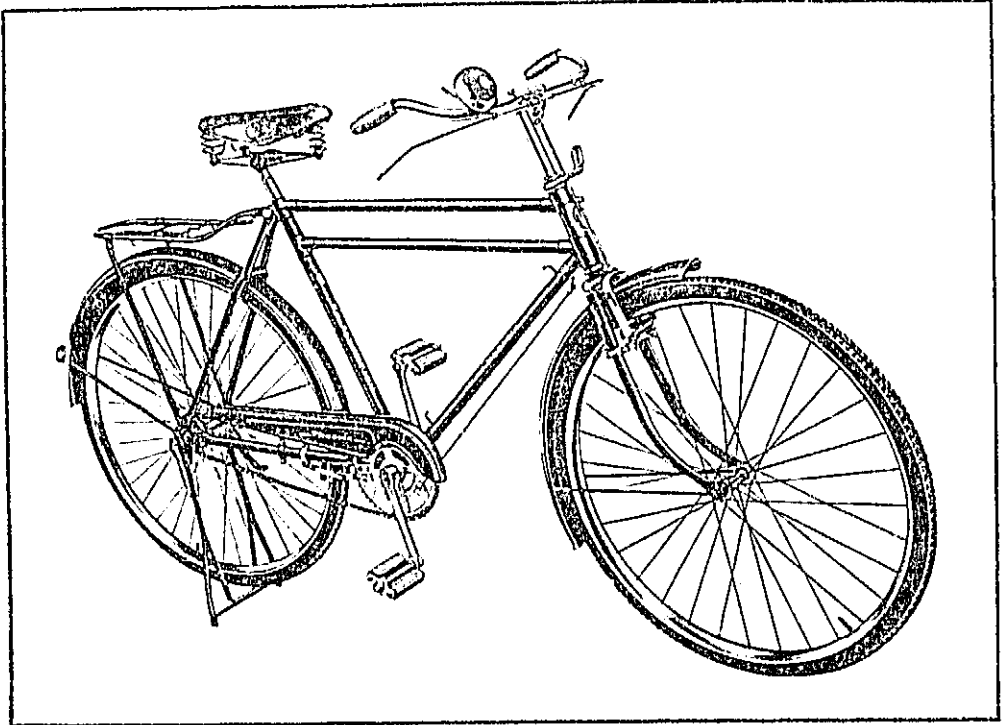
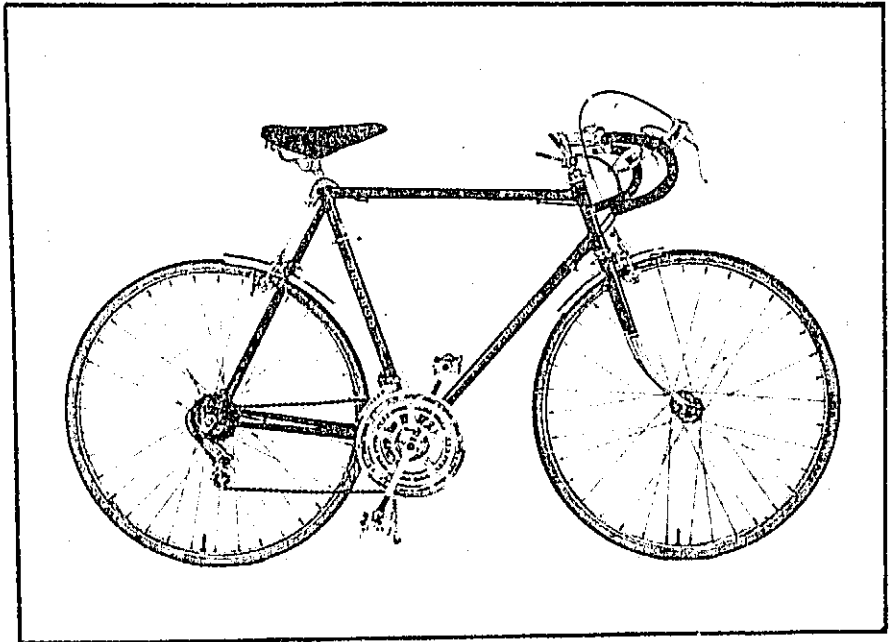


Plate 1.2
AN AUSTRALIAN BENNETT 'MONTREAL "FFS"'
(BenCat 1978:6)



There are undoubtedly some important lessons for so-called developed countries' cyclists to learn from a careful analysis of the nature and scale of bicycle use in the often harsh riding conditions encountered as a matter of course in other places. The uses made of the bicycle in rural Australia for some decades were in several respects not unlike those still seen in much of the world. In addition to its intrinsic historic interest for Australians, perhaps this study will provide some insights into the more appropriate design and use of bicycles, wherever they may be used, and under whatever conditions.

III. Objectives

The bicycle and bicycling represent a unique and fascinating combination of technology and human energy. The machine has been adopted (and adapted) for use in a wide variety of situations. The nature of the bicycle's use results from a complex interaction of

- the technological characteristics of the machine itself;
- the human input; and
- the social and physical environment within which the use takes place.

These three components of bicycling -- man, machine and environment -- comprise an intricately functioning system.

The objectives of this study are to

- describe and assess the nature and characteristics of rural Australian cycle use;
- to understand the relative importance of, and the interactions between, the various factors contributing to that use;
- to suggest something of the impact of that use; and
- to draw some lessons from it that may be applied towards

understanding the bicycle's use in other contexts.

There has been no previous research into the use of the bicycle in rural Australia, and only a couple of popular articles (Dunstan 1973; Mitchell 1977) have been written on the history of Australian cycling in general. These are incomplete, and at times inaccurate and misleading. This thesis provides a comprehensive and, occasionally, detailed historical account of Australian cycling in general. But it is not intended as a history; its main objective is to understand the complex of factors, and their interactions, involved in the use of the bicycle in rural areas. Many aspects of cycling discussed in this work apply equally well to the present and future.

The study ranges from the earliest known use of a bicycle (a velocipede) in Australia (1867) to the present day, but since the most important period of rural use was from 1893 to about 1930, effort has been concentrated upon that era.

There has been no attempt to define 'rural' in any rigorous sense. Many elements (such as the machines used, the energy input, climate, and even the nature and quality of roads in many instances) are common to both rural and urban areas, however defined. But there are some distinctly different problems faced by rural Australian cyclists, both in kind and degree: great distances, sparse population, scarcity of food and water, and vegetational and surface conditions more varied than in the city. The study concentrates upon those who used the bicycle for such work as mustering sheep, boundary riding, and prospecting, and those who merely travelled through the countryside in the process of getting from one place to another, be they commercial travellers, itinerant shearers, or tourists.

The study is divided into two sections, Part I, 'The Elements',

looks at the machine (Chapter 2), the human input (Chapter 3), and the relationship (and adaptation) of man and machine to the environment (Chapter 4). Part II, 'The Uses', considers the rural use of the bicycle in a chronological framework, divided between the 1890s (Chapter 5) and the twentieth century (Chapter 6); there is strong evidence that the turn of the century saw important changes in emphasis and attitudes to bicycle use in Australia.

For illustrative purposes there are frequent references in Part I to particular cycling incidents or journeys that occurred at various times in Australia. The specific chronology and context of those respective journeys are given in Chapters 5 and 6.

PART I.

THE ELEMENTS

Chapter 2
THE MACHINE IN AUSTRALIA

I. Commercial Aspects	35.
Introduction into Australia	35.
The United States - United Kingdom Debate	39.
Australian Manufacturing	42.
Sales	46.
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I. Commercial Aspects

Introduction into Australia

'The invention of the rear-driven pneumatic cycle is an event destined to influence ... our manner of life, to an extent which few of us as yet fully realise'.

(Austral Wheel 1/96:1)

Advances in overseas cycle technology were introduced to Australia as a result of an intense interest in cycling matters that was developed and maintained by a cadre of tourists, racers, clubs and commercial interests. In 1867, half a decade after its invention in Europe, a velocipede was built in Goulburn by W.A. George, with the aid of 'an ingenious Yankee' (Quinn 1896:27). The first velocipede was introduced to Melbourne in 1868. The following year, in July, Australia's first bicycle race was held at the Melbourne Cricket Ground (Mitchell 1977:175); although Pearson (1925:17) claimed that in 1867 there were 'contests' on the old Albert Ground in Redfern. Sydney velocipedists toured as far afield as Campbelltown and Windsor (SMH 18/5/1870:5).

The first ordinary bicycle in Australia was imported into Melbourne in 1875 (Dunstan 1973:250). Adherents eventually formed the Melbourne Bicycle Club in 1878 (Dunstan 1973:251), the Sydney Bicycle Club in 1879 (George 1896:2), a Tasmanian club in 1880 (Mitchell 1977:175), and South Australian (Mitchell 1977:175) and Brisbane Bicycle Clubs in 1881 (Fletcher 1896:127). By 1884 an intercolonial cycle meet in Sydney included riders representing Sydney, Melbourne, Brisbane, Goulburn and English bicycle clubs (SBC 1884). Western Australia's first club was not formed until the late 1880s. It died a 'natural death' (WAWh 31/12/97: III) soon thereafter, and was eventually superseded by the W.A. Cycling Club in 1891. Cycle clubs were also established in some rural communities;

Dubbo had one by early 1886, for example (AuCyNews 13/2/86:201). In 1884 Alf Edward became the first to cycle from Melbourne to Sydney, taking 8½ days for the trip along the Hume Highway (Kinnimont 1892). That same year the first cycle trip between Melbourne and Adelaide was completed, requiring eight days (Mitchell 1977:176). In November, 1888, George Burston (1890) and H.R. Stokes left Melbourne on a round-the-world cycling trip. They travelled via Java, Singapore, Penang, Rangoon, India, Egypt, Palestine, Asia Minor, Sicily, Europe, the British Isles and the United States. They were the first Australians to do such a journey, and among the few world cyclists to ever complete it on ordinary bicycles.

Australia's first cycling boom, occasioned by the ordinaries, occurred during the 1880s, with Melbourne the premier cycling centre, a fact acknowledged even by Sydneysiders (Quinn 1896:27). Early in the decade the country's first cycling journal, Bicycle, was founded, but survived only a few months. It was followed by Bicycling News, which lasted about 18 months. The third journal, Australian Cycling News, folded in 1889, after a sporadic career (AuCy 7/9/93:1-2). Although 1,500 bicycles were imported into New South Wales in 1887 (Quinn 1896:27), for example, the cost of the high wheelers and the difficulty of riding them meant they would never become the mount of the masses. By the end of the decade cycling was well established, but essentially limited to a small segment of the society.

The safety bicycle changed all that. The machine's speed, safety, ease of riding and progressively decreasing cost resulted in it capturing the imagination of an increasing proportion of the general Australian populace and the energy of numerous inventors and mechanics. As the 1890s progressed a cycling craze swept Australia; the country found itself in the mainstream of the world bicycle boom, with machines being imported along with cycle journals, social attitudes, and accompanying debates.

By mid-decade, among other things, cyclists (as female riders were then commonly known) were not unusual on the streets; churches still argued the morality of Sunday cycling; doctors debated the effects of riding; numerous Australian cycle journals were about to get underway; and bicycle dealers were gaining reputations formerly attributed to horse traders.

It has been impossible to determine exactly when the first modern rear-driven safety bicycle reached Australia, because dwarf bicycles were also called safeties in Australia for some years. Some of the dwarf models were commercially available in Australia by at least mid-1885 (IRM 1885:26; AuCyNews 12/9/85:17) and races for them were included on intercolonial racing programmes in August of that year (NSWCU 1885:11). The earliest specific reference to a modern rear-driven safety bicycle in Australia is Pearson's (1925:14) importation of one into New South Wales in 1887; various reminiscences and accounts from the 1890s, however, leave the impression that several were imported that year. The diamond frame machines were commercially available in Melbourne, reportedly for the first time, in 1889 (AuWh 5/98:127). The pneumatic tyre, re-invented by Dunlop in 1888, was possibly imported into Australia in 1889, but was definitely fitted to commercial machines in Melbourne in 1890 (AuWh 5/98:127).

By mid-decade Australian commercial interests were displaying European and North American models and accessories within a few months of their introduction in the parent countries. But during the height of the world craze (particularly in 1895 - 1896) Australian cycle dealers often had long waits as manufacturers were unable to meet demands; the popular German 'Electra', for example, was not displayed at the first Australian Cycle Show in Melbourne in early 1896 because local stocks were depleted (AuWh 6/96:157). To stimulate sales, manufacturers began

to introduce new patterns annually. At first Australian dealers, allowing for shipping time, received the 1896 models by about March or April, 1896. However, manufacturers introduced new patterns progressively earlier each year; Australian dealers were eventually placing 1899 models in the showrooms by late 1898 (SMH 28/10/98). Bicycles and accessories, though, were still being sold in some Australian cycle shops (especially in rural communities) long after being superseded -- but not made obsolete -- by new patterns.

The annual pattern change, probably a relatively new experience for Australian consumers, raised a vexing question: what did it mean in terms of technological advances? Some felt that the new patterns incorporated important changes, that local Australian cycle manufacturers would have 'no chance of keeping pace' with such rapid overseas developments, and that local production would be stifled (Age 16/4/94:4). However, it was not long until many realised what the Perth Morning Herald (13/5/98:2) eventually noted: it was 'generally recognised that the building of bicycles has reached a stage of perfection which admits of very little improvement from season to season. Any improvements that are made are only in details, for the outline of the frame and size of the wheels are now almost identical in 99 bicycles out of every 100 made during the past two years'. Despite such observations some, including inexplicably the Morning Herald (30/12/98:2) only seven months later, persisted in claims that the annual changes were indeed of value.

The United States - United Kingdom Debate

'I myself am an Englishman and don't believe in American-built bicycles. In my opinion they are seen to much more advantage in the shop windows than on our rough country roads'.

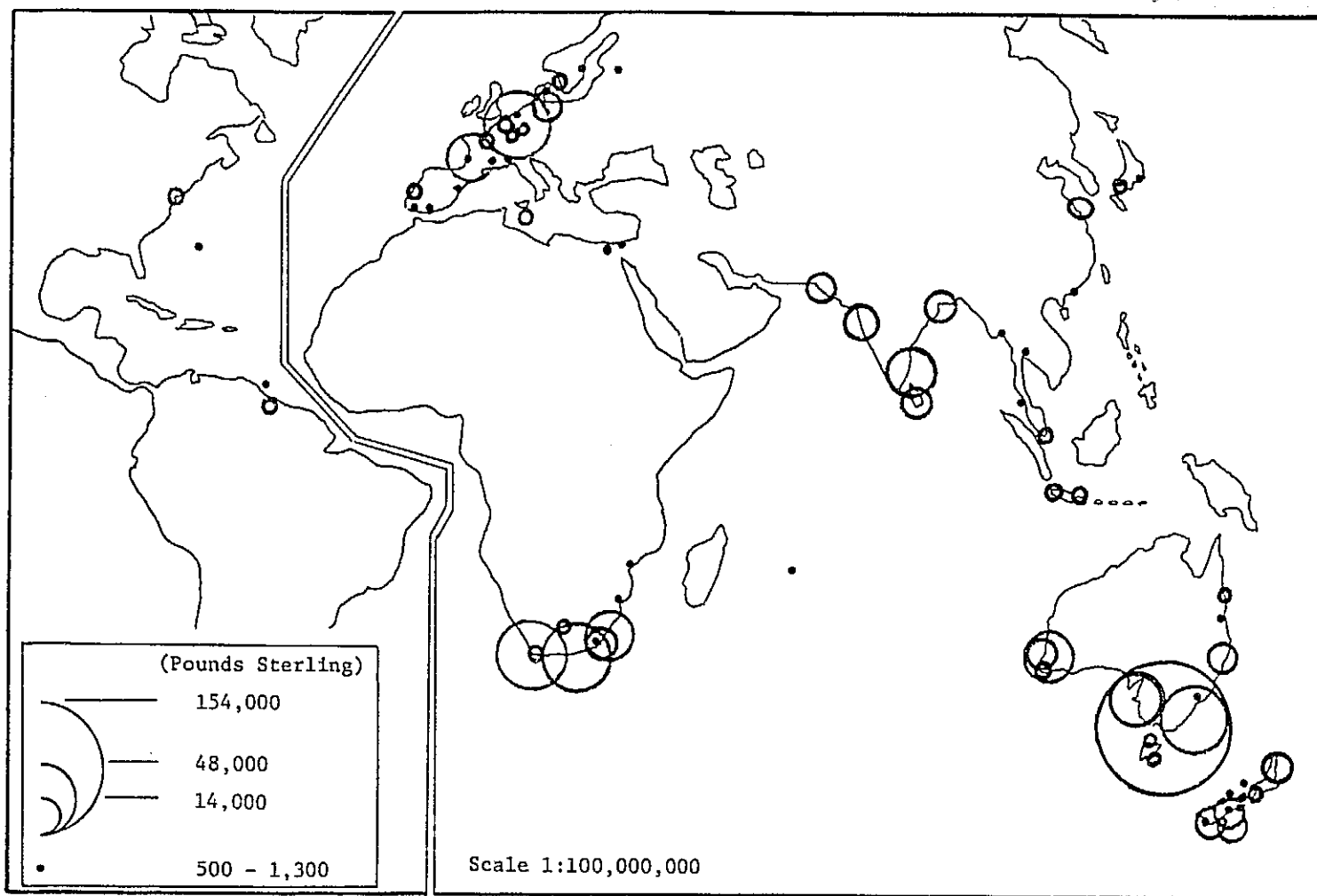
An Australian resident (Austral Wheel 10/96:283)

'... like every other machine which we have copied from other peoples, this has been materially improved by American mechanics'.

(Scientific American 9/1/1869 --
cited in Ritchie 1975:62)

Bicycles and parts sold in Australia came from both Europe and North America; some were imported complete, others assembled locally. Unfortunately there is little information concerning the specific number and national origins of imported bicycles and components; they were grouped variously with carts, waggons, or hardware in the various colonies' customs returns, and after federation were often grouped with motorcycles and motor vehicles. In 1896 one Brisbane writer had to 'thrash round among agents' to determine how many machines had been imported during the previous four years, for example (Fletcher 1896:128). British manufacturers were the most important source of machines, and Australia absorbed 38.6 percent of English cycle exports in 1897 (Sturmeay 1898:142) (Figure 2.1). Other European countries, especially France and Germany, exported machines to Australia. From North America the Canadian 'Massey-Harris' bicycle was widely regarded in Australia, sold well, and the firm won a three year contract to supply machines to the Melbourne postal authorities (AuWh 7/98:190). The United States manufacturers were the greatest competitors to the British. As the American cycle industry expanded rapidly and began to saturate its local market in the mid-1890s, manufacturers cut prices drastically and sought overseas outlets (Harmond 1971:250). Harrison (1969) suggests that the

Figure 2.1
DESTINATION OF ENGLISH CYCLE EXPORTS - 1897
(Sturmey 1898:142)



British did not appreciate the 'boom' nature of the 1890s cycle craze and were unprepared for the lowered United States prices and aggressive exporting. As a result the Americans heavily penetrated the Australian market from 1896 - 1900, in particular; after the turn of the century the British regained a relatively unthreatened hold on it.

The British were hesitant to modify their machines for export; a Canadian request for bicycles without chainguards was refused on the grounds that the bicycle was incomplete without it (Harrison 1969:294). In this respect the Americans, to cut costs, eliminated mudguards, footrests (on fixed wheel machines), chainguards and brakes. Since the Australians had a tendency to not use these items, with the exception of the brakes, the 'stripped down' American machines suited the Australian buyer. The lack of accessories contributed to the American bicycles being lighter, a trend 'pooh-poohed' by United Kingdom cycle interests (Pemberton 1897:39) but generally approved of by Australians; as one journalist commented, weight added neither to utility, speed, nor ease of pedalling (AuWh 11/96:319). And in rough conditions where machines had to be carried, a heavy bicycle on the shoulder was no pleasure (Green 1978).

Cycle dealers accused the British of long delays in overseas deliveries, not stocking up in 'off-seasons', giving home trade preference over the colonies, and unfair rotation in the execution of orders. From a merchandising standpoint the Americans were said to provide more colourful and attractive catalogues and were more aggressive and persuasive salesmen (Harrison 1969:291-292). Australians pointed to the Americans' concern over the packing and shipping of machines and their recognition of the need to compromise with Australian agents regarding shipping and purchase costs (WAWH 11/6/97:17). The Americans modified

the cycle manufacturing process to minimise steps and used cheaper materials where possible. While some claimed this lowered the quality of the machines, British sources suggested there was little evidence of lower grade materials being used, but rather less attention being paid by the Americans to the finish, number and quality of accessories, and the care and skill lavished on some components (Harrison 1969:299). In this regard the observers had noted the definite trend in American manufacturing to be concerned less with aesthetics than the quality of essential items on machines; 'The aesthetic-that-was-not-functional, the ornament that was merely traditional, had no place in the American scheme' (Boorstin 1973:194). Nonetheless, Australians alluded specifically to the flashiness of 'first-class Yankee jiggers' (WAWh 5/2/97:16).

While the rivalry lasted considerable debate raged over the relative merits of the English and American bicycles. Some argued that the heavier English bicycles were more durable, and hence better for Australian conditions. Others felt the lighter American machines were stronger, faster and more suited to Australia (BellWA 5/9/96:2). By the end of the decade a variety of American and English machines had been used successfully throughout rural areas, on overland rides, and for track racing, and they appear to have been generally comparable in quality and performance.

Australian Manufacturing

'... quite the equal of the English work ...'

(Austral Wheel 6/96:156)

A significant Australian cycle industry was developed during the 1890s, particularly in Victoria. Although some components (such as

seamless steel tubing) were not produced in Australia, many items (such as hubs, cranks, and axles) were. Bicycle assembly was a relatively simple matter and several Australians had cycle building experience dating from at least the late 1870s (AuWh 10/96:308, 3/97:104). Several 'Australian' bicycles such as the 'Bond' (Plate 2.1), 'Dux', 'Brassey', 'Carbine', and 'Southern Cross' were marketed nationally. Some of the Victorian operations were large, with the Dux Cycle Co. employing a reported 150 workers in Little Collins Street (WAWh 24/12/96:13). At the other extreme was the individual cycle dealer constructing his 'own' brand or building a bicycle to order, using whatever combination of components the purchaser desired. Some New South Wales and South Australian dealers were rumoured to have placed pirated emblems of well known firms on their locally assembled 'inferior' machines (AuWh 5/97:154).

While production on the Victorian scale was not seen elsewhere in Australia, there were numerous and occasionally substantial operations in other colonies, such as Lewis in Adelaide, Armstrong in Perth, Smith in Brisbane, and Bennett & Wood and Phizackerly of Sydney. As well, relatively large and bustling operations were found in some surprising locations, such as Mount Magnet on the Western Australian goldfields (Thiel 1901:681) (Plate 2.2). In contrast, in Tasmania there had reportedly been only one attempt at local manufacture by mid-1896 (Langridge 1896:32).

One advertised advantage in local assembly was that the machines were tailored to local conditions; by selecting appropriate components the dealer or manufacturer could supposedly create a superior product, based upon his or the purchaser's Australian cycling experience (AuWh 1/99:30). The quality of locally assembled bicycles appears to have been very good, according to contemporary reviews (even allowing for patriotic

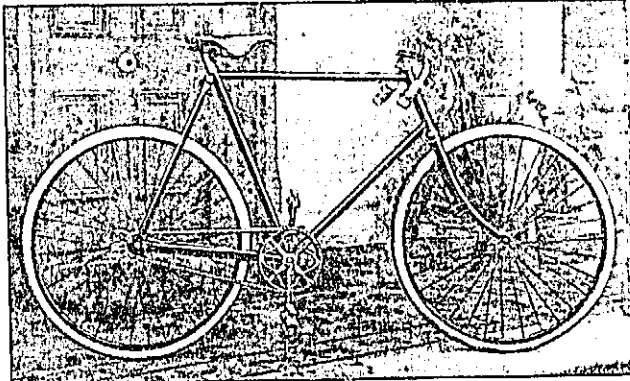
Plate 2.1
 AN ADVERTISEMENT FOR S. BOND - CYCLE ENGINEER, MELBOURNE
 (AuWh 10/96:308)

S. BOND  (17 Years' Experience)

.. Cycle Engineer .. **94** LITTLE COLLINS ST.,
 Melbourne.

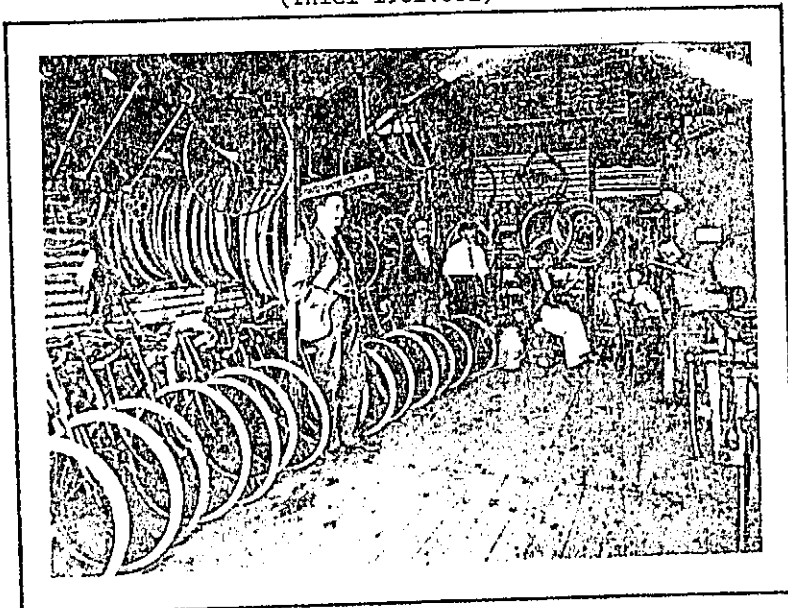
BUILDER 
 OF THE
"Bond"
Cycle

For GENTLEMEN..
 LADIES, and ...
 CHILDREN



All Classes of REPAIRS EXECUTED. Best Materials and First-class Workmanship Guaranteed.
 NOTE. Special Attention paid to WORKING OUT INVENTOR'S IDEAS.

Plate 2.2
 A. CLYDESDALE'S CYCLE FACTORY, MOUNT MAGNET, WA
 (Thiel' 1901:681)



veneering). At the Australian Cycle Show in 1896 a correspondent commented upon the high quality of various locally manufactured parts and indicated that 'the firm could hold its own in making parts with home firms' (AuWh 6/96:156). A Western Australian noted that Victorian machines compared favourably with English bicycles (WAWh 24/12/96:8) and were well received in the west. The widespread use of Australian-built machines in rural areas, for track racing and general touring suggests they were of excellent quality. However, since the components and techniques of assembly were essentially those used abroad there are strong grounds for doubting any actual superiority of local products.

Overseas machines were often claimed to have been made specifically for Australian conditions (Worker 3/9/08:18). One dealer claimed that he had ordered bicycles from overseas factories 'specially built' for rural Australian use, based upon his experience and specifications (MenMin 27/11/96:3). Another claimed that 100 bicycles had been specially made for the 'rough country and sandy tracks of W.A.' in particular (MtMag 13/6/96:2). However, there is no indication as to how the machines actually differed from others. Given cycle manufacturers' and dealers' penchant for advertising every possible differentiating aspect of their machines, the conclusion is that most such claims were unsubstantiated advertising gambits. The few known instances of special modifications are discussed later.

There were only a few models to choose from in Australia for many years. Firms generally produced one or two standard men's models, differing somewhat in weight and accessories. These were called roadster or touring models, although terminology was not consistent. Alternatives were a heavier men's model, a ladies' model, occasionally a heavier duty ladies' model, and a light track racer. Children's machines were rarely advertised or discussed in journals, and the impression is that they were

not common or widely available until near the turn of the century. Some firms priced all models equally; however, most tended to charge 10 to 25 percent more for models other than the standard men's machines. As well, in-line and side-by-side tandems, and tricycle carts were sold by some Australian cycle dealers.

Sales

The total number of bicycle brands available in Australia reached a peak around 1897, when about 150 were on the market (Table 2.1). There was probably relatively little difference between them, in many cases no more than paint and decals. However, the lack of rigorous tests, the confusing and contradictory claims in advertisements, and the lack of objective reporting by cycle journals make it impossible to accurately assess real differences. One can only sympathise with those purchasers trying to make sense of the seemingly never-ending number of brands and models and the advertisers praising their own machines as the 'fastest', 'most reliable', 'strongest', 'leading', 'most complete', 'nearly perfect', 'superior', 'best', or 'most durable' of the lot!

The number of bicycles sold in Australia during the 1890s is difficult to estimate. Colonial records indicated imports in terms of value; the radically varying prices during the decade make it impossible to accurately convert this to specific numbers of machines. As well, rates of duty differed from colony to colony and assembled machines could be assessed differently from disassembled ones; parts were often assessed at yet another rate.

Some approximation can be given, however, of the relative magnitude of cycle sales. A year-by-year comparison of Western Australian customs returns (WACus 1896 - 1901) with general retail prices suggests that a total of between 15,000 and 20,000 bicycles were imported into Western

Table 2.1
A PARTIAL LIST OF BICYCLES FOR SALE IN AUSTRALIA IN 1897
(Various sources)

Acme	Greville	R. & P.
Adlake	Grimley	Racycle
Allards	Henley	Raglan
Alldays	Henry	Raleigh
America	Herald	Rambler
Ariel	Hollis	Ranger
Barnes	Humber	Red Bird
Black Bird	Huntsman	Referee
Blitz	Imperial	Reform
Blue Bird	Invincible	Remington
Bond	I.R.	Rothwell
Bostado	James	Rover
Boudard	Juno	Roxbury
Boulevard	Keating	Royal Enfield
Calcott	King of Fliers	Royal Progress
Carbine	Lea	Ruby Rim
Centaur	Lewis	Rudge-Whitworth
Challenge	Macklin	Sans Pareil
Cleveland	Maud	Simpson
Clyde	Marschner	Singer
Columbia	Mascotte	Snell
Court Royal	Massey-Harris	Southern Cross
Coventry	Mercury	Sparkbrook
Coventry Cross	Monopole	Spartan
Crescent	National	Spitfire
Czar	Naumann	Stanley
Czarina	New Haven	Star
Day-Break	New Howe	Stearns
Dayton	New Hudson	Sterling
Dux	New Rapid	St. Swithin
Eagle	Nimrod	Swiftsure
Earlscourt	Orial	Triumph (U.K.)
Eclipse	Ormonde	Triumph (U.S.)
Eglinton	Osmond	Tyler
Electra	Osmonde	Union Crackajacks
Elite	Outings	United States
Elk	Owen	Valkyrie
Elswick	Palmer	Vanguard
Ema	Peerless	Victor
Excelsior	Phiz	Victoria
Express	Phoenix	Viking
Field	Premier	Volta
Fowler	Prinetti Stucchi	Williams
Flying Wheel	Psycho	Wood
Gladiator	Quadrant	World
Granville	Quinton	Zimmy

Australia from 1895 through 1900, for example. Victoria reportedly imported over 17,000 whole machines in 1896 (MorHer 26/6/97:2). Sturmey's (1898:142) figures indicate that Melbourne received 21 percent of total British cycle exports in 1897. A comparison of Victorian customs returns (WACy 26/5/99:59) with retail prices suggest that Victoria imported about 20,000 bicycles in 1897, but only about half that number the following year; the same source (WACy 26/5/99:59) predicted that even less would arrive in 1899. Local production (assembly of imported and locally manufactured parts) must be added to this. Overall, probably 75,000 to 100,000 bicycles were sold in Victoria up to and including 1900. To extrapolate these figures to other colonies would be erroneous, however, as Victoria was recognised as particularly cycle-conscious. The United State Consul-General in Melbourne, in reporting to the United States State Department, credited the colony with 'having received 35 per cent more machines than any other country in proportion to population' (MorHer 26/6/97:2). Interestingly, given that Western Australia's population of 184,000 in 1901 was only 15 percent of Victoria's 1,201,000 (AusYrBk 1969:121), it appears that the per capita ownership of bicycles was at least as great in Western Australia (Table 2.2).

Most bicycles saw only occasional rural use, principally for touring. How many were used for rural transport and work on a regular or sporadic basis is impossible to estimate.

Table 2.2
AUSTRALIAN DESTINATIONS FOR ENGLISH CYCLE EXPORTS: 1897

	Value ¹	(I) Percent of Australian Imports	(P) ² Percent of Australian Population	(I)/(P)
VICTORIA	153,833	55.0	31.8	1.73
Melbourne	153,833			
NEW SOUTH WALES	52,105	18.6	35.9	.52
Sydney	51,404			
Newcastle	701			
SOUTH AUSTRALIA	26,606	9.5	9.5	1.00
Adelaide	26,606			
WESTERN AUSTRALIA	24,257	8.7	4.9	1.78
Perth	16,024			
Fremantle	6,431			
Albany	1,607			
Geraldton	195			
Broome	11			
QUEENSLAND	18,729	6.7	13.2	.51
Brisbane	13,640			
Townsville	2,865			
Rockhampton	1,168			
Mackay	407			
Maryborough	290			
Bundaberg	117			
Normanton	77			
Cairns	58			
Cooktown	31			
Thursday Island	23			
Bowen	20			
Charters Towers	17			
Bluff	16			
TASMANIA	3,843	1.4	4.6	.30
Launceston	1,995			
Hobart	1,848			
NORTHERN TERRITORY	40	-	-	-
Port Darwin	40			
TOTAL	279,413			

¹Pounds Sterling (Sturmev 1898:142)

²For 1901, the nearest year for which a comparative nationwide census figure is available (AusYrBk 1969:121)

Cost

'... discounts ranged up to 95 per cent, with another two and a half off for cash'.

(Pemberton 1897:209)

Roadster and touring bicycles, those most commonly used in the bush, cost approximately £25 to £35 in the early 1890s. By January, 1896, some bicycles had dropped to below £20 and one Melbourne club imported in bulk at £19-7-6 each (AuWh 2/96:49). From then prices plummeted as overseas producers sought to maintain sales in the face of overproduction. By early 1897 machines were available for as little as £5, with mass retailers like Foy & Gibson selling them for £7-15-0 to £10-10-0 (AuWh 4/97:123). Agents eventually auctioned excess stocks to make way for new models (AuWh 3/99:93) and some non-franchised entrepreneurs were reportedly auctioning superseded models without the agent's authority (AuWh 11/98:331). By 1900 new bicycles could be commonly obtained for £6 to £7, although higher priced machines were available. The American mail order firm of Sears, Roebuck & Co. offered their machines in Australia for as little as £4-4-0, including shipping costs, via mail order (AuWh 11/99:303).

After the turn of the century (which saw the collapse of the American cycle manufacturing boom and a rationalisation of both American and English manufacturing) prices ranged from about £6 - £15, depending upon quality and accessories. Also it was normal to include a pump (or inflator, as they were then commonly called) and tools for the price, a practise begun in the late 1890s to stimulate sales. Prices remained relatively stable, even dropping slightly, for the next couple of decades. Anthony Hordern & Sons (1907:302) for example, in 1907 offered their 'Universal' bicycle with Dunlop steel rims and tyres, freewheel and backpedal brakes, Brooks' saddle, tools, inflator and oiler, for £13-10-0.

The same bicycle was offered in 1911 (Hordern 1911:334) and in 1914 (Hordern 1914:387) for only £11-10-0; a two-speed gear could be had for an additional pound. By 1924 the same bicycle (without a two-speed gear) cost £16-10-0 (Hordern 1924:256). However, they offered a similarly equipped 'Marathon' model (as used by Francis Birtles in his Northern Territory travels), for only £11-15-0, including a two-speed hub. During the 1930s new bicycles could be bought in Collie, WA, for £4-10-0 (Riley 1976) and in Guyra, NSW, for £6-10-0 (Faulkner 1977b), including tools, toolbag and pump. Prices were occasionally even lower; in Collie, WA, Japanese bicycles with freewheels and backpedal brakes were retailed at only £3 in the 1930s, for example, and quickly captured an estimated 25 percent of the market (Riley 1976). The brand of tyre also affected the price. In 1898, in Western Australia, a particular English bicycle shod with Dunlop tyres cost £9; the same machine fitted with another, unnamed, brand was only £7-15-0 (WesMail 17/6/98:8). The relative price differences between brands of tyres decreased in later years.

Bicycle prices varied substantially across the country and between urban and rural communities. In the colonial era this partly reflected differing rates of duty. New South Wales applied no duty to either machines or parts, and Victoria only 10 percent to the machines. In contrast, Western Australia levied a 15 percent duty on all machines and parts, Tasmania 20 percent, and the Northern Territory 15 percent. Queensland applied 15 percent to the machines and allowed certain parts in free. South Australia levied 25 percent on machines but nothing on most parts (Sturmey 1898:143). Bicycle prices were lowest in Melbourne, with Sydney slightly higher. Perth prices tended to be about 20 percent higher than in Melbourne, partly because many machines from overseas reached Western Australia via Melbourne, meaning additional transport costs.

The few prices advertised by cycle shops in rural communities indicate that bicycles and parts were often 10 to 20 percent higher than in metropolitan areas, partly because of transport costs. However, some rural dealers tried to take advantage of lack of competition. For example, while Dunlop listed one price throughout Victoria for a given tyre or tube, some rural dealers charged more (aside from legitimate additional carriage charges). Dunlop staunchly opposed the practice and notified journals and newspapers to that effect (AuWh 1/99:15).

When cycle prices dropped markedly in the mid-1890s it caused considerable confusion concerning the relationship between price and quality. Many people could not understand how machines selling for £20 to £25 were, within a few months or weeks, progressively lowered to £12 to £15. Although some writers realised that it was due to overproduction, they felt it could not last and advised buyers to move quickly. Many suggested that the prices reflected a lowered quality, particularly in bicycles destined for export (AuWh 4/97:113-114; WACy 12/5/99:18). However, some Australian observers pointed out that since in many instances a given bicycle in a shop had been substantially lowered in price, it was not possible to categorically equate lower prices with inferior quality.

As large numbers of ever-cheaper new bicycles came onto the market, resales and trade-ins resulted in an increased supply of used bicycles. It is extremely difficult to assess used bicycle prices as very few advertisements, whether private or commercial, in large cities or rural communities, listed them. The few figures encountered suggest that used machines at first sold for upwards of three-quarters of the new price. As new prices plummeted used machines became available at only a fraction of the cost of new ones. By 1915 in Western Australia used bicycles could be obtained from private sale for as little as 10 to 20 shillings

-- although £1 to £3 was more common (Witt 1977) -- and through dealers at one-half to two-thirds new prices (Boulton 1976; Riley 1976; Tate 1976b).

The relative cost of a bicycle with respect to a rural worker's income can be roughly estimated. Macarthy (1967) calculated average weekly wages for rural New South Wales workers for the period 1890 - 1921 (Figure 2.2). It would appear that by 1897 (when bicycles were beginning to be used by rural workers in that colony) a low-priced new bicycle could be bought with the equivalent of about four or five weeks' wages, and used machines for perhaps two to three weeks' earnings. The situation remained relatively constant until about 1910. By 1920 a low-priced new bicycle could be had for two weeks' wages or less; even the higher priced models (with numerous accessories and presumably of better quality) cost less than four week's earnings. However, Macarthy's figures include an allowance for board and keep (although he does not indicate how much); hence, for many rural workers bicycles would have cost the equivalent of several additional days work in terms of available cash.

Many cycle dealers advertised 'Easy Terms' for purchasers of their machines, such as a £5 deposit and £2 per month on a 24 'Volta' (WAWh 14/5/97:20), or a ten shilling deposit and 4 shillings per week for a £6-10-0 bicycle in the 1930s (Faulkner 1977b). A large cycle shop in Canberra in 1939, for example, normally requested a one-third down payment and the balance in 12 months (Bell 1978); although the total payment for a bicycle bought on terms ranged from 16.5 to 21 percent more than the cash price, all machines sold in the shop that year were financed (Nish 1939). There is no suggestion that finance companies were commonly involved; the cycle dealers appear to have handled financing themselves. It is highly unlikely that itinerant workers such as prospectors or shearers

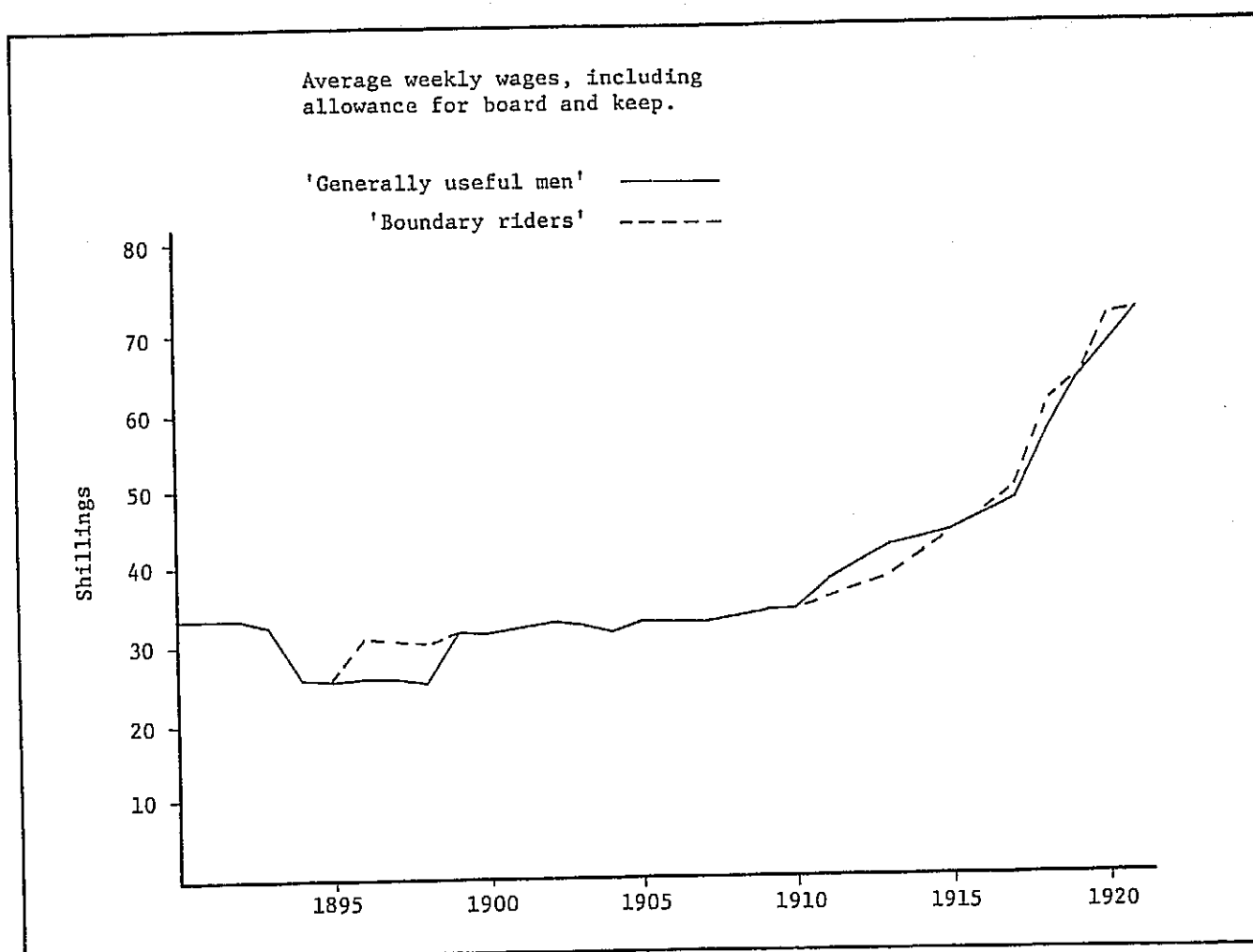


Figure 2.2
AVERAGE WEEKLY WAGES - RURAL NSW: 1890 - 1921
(Macarthy 1967:147-148)

would have been allowed to ride off on a machine after only a deposit was made; such arrangements would have been available only to known locals with established reputations (Riley 1976; Scahill 1976).

While many items -- land, pianos, food -- were bought on credit or terms prior to the turn of the century (Blainey 1978), there has been no study of the development of credit schemes in Australia (Blainey 1978; Forster 1978; Pincus 1978); consequently it is impossible to place bicycle purchase schemes within a proper perspective in the Australian economy and assess their relative impact. The number of bicycles sold in Australia and the prevalence of 'terms' would suggest that the machines may have been very important in establishing among a broad segment of society the acceptance of the concept of hire-purchase. The matter certainly merits further investigation.

Distribution

New bicycles were obtained from dealers in the cities (Plate 2.3) and larger centres or through their agents in smaller communities. Bicycle shops were soon established in most rural towns (Plate 2.4) and many had several. In Western Australia in the 1890s, for example, the largest cycle agency in the colony, Armstrong's, was founded in Coolgardie and maintained a network of shops throughout the goldfields, as well as metropolitan and coastal communities. In some cases (especially in very small towns) cycles were stocked by unrelated businesses, such as chemists (Quinn 1896:24; WAWh 5/3/97:11), although some writers cautioned against buying from those who dealt 'sausages and jiggers out of the same window' (WAWh 19/3/97:11). After 1900 the number of specialist cycle dealers diminished but more businesses added cycles to their line of merchandise and the machines remained widely available.

Plate 2.3
THE 'ELECTRA' CYCLE DEPOT, MELBOURNE
(AuWh 8/98:214)

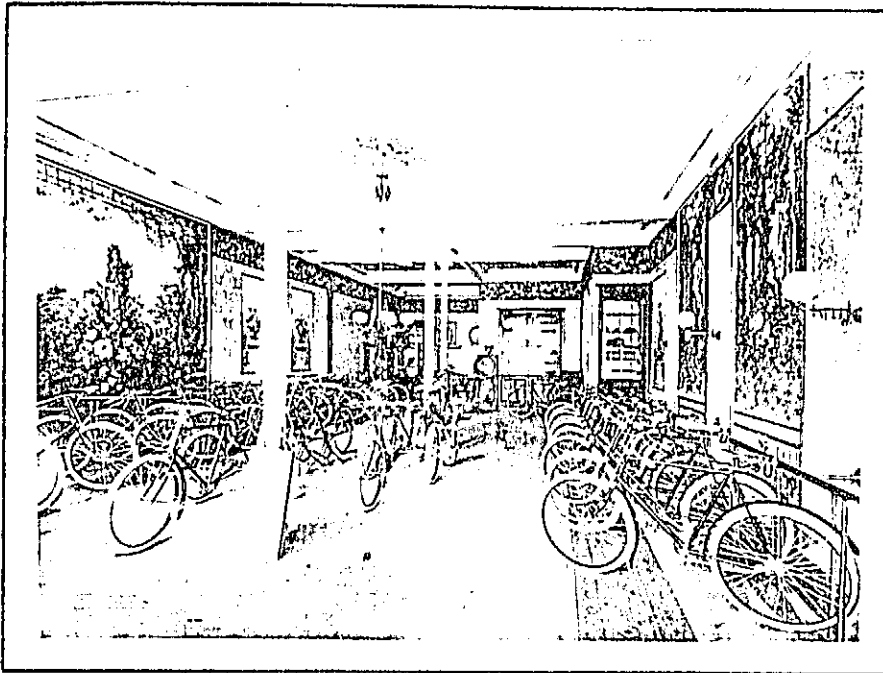
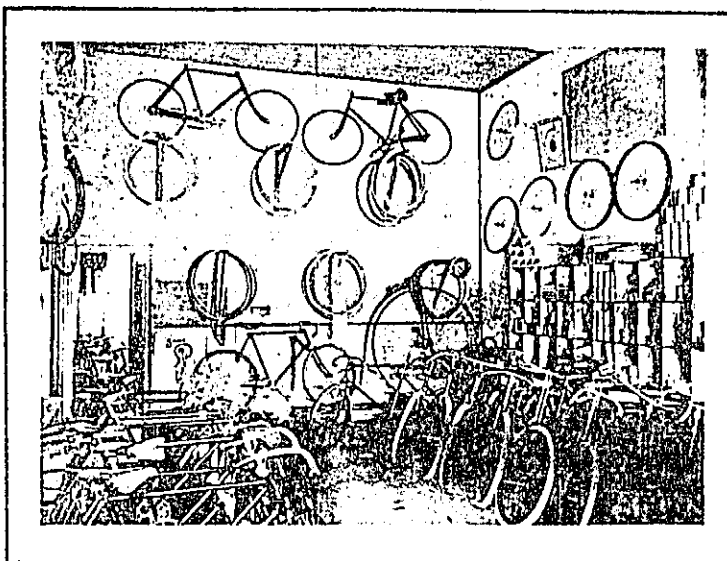


Plate 2.4
BAXTER'S CYCLE AGENCY, BOULDER CITY, WA
(WesMail 12/01:36)



The bicycle and parts lent themselves to rail and postal distribution. The 'Electra' agent in Melbourne posted parts throughout Australia (AuWh 11/99:310), and one Perth tyre dealer who specialised in joining tubes pointed out that six pence covered the postage cost from any part of the colony to his shop (WAWh 31/12/97:7). Firms like Anthony Hordern & Sons shipped bicycles and parts throughout Australia. Massey-Harris benefitted from the ability to sell through a well established network of farm machinery agents (WesStar 9/5/00:1). As the use of bicycles by shearers increased, even large stations stocked parts (Bean 1910:54).

Used bicycles were available through cycle dealers and from private sales. There is no way of knowing what proportion of second hand bicycles were sold by each means. In Collie, WA, for example, used bicycles accounted for about one-third of dealers' sales (Riley 1976), while in the goldfields Witt (1977) said that most of his rural cycling acquaintances acquired their used machines from private sources. Surprisingly few used bicycles were advertised in rural newspapers and word-of-mouth must have been important; even in the larger cities the classified columns carried fewer advertisements than might be expected. A member of Blakeley's (1938:74-75) party obtained a private bicycle in Milparinka, NSW, by negotiations that lasted for several hours; it was sorely needed and the alternative was to wait for one to be brought up from Broken Hill. Later, in Pine Creek, NT, where again there were no bicycle shops, they attempted to negotiate for another, but found that 'a wife would have been cheaper' (Blakeley 1938:244). They left town without a replacement.

Bicycles were available for hire. A Tasmanian brochure early this century pointed out that tourists could hire machines in most towns and at some railway stations (Evans 1906:9,37). The Lombard Cycle Works of

Subiaco, WA, during the second decade of this century hired out a tradesman's bicycle (including insurance and maintenance) for four shillings per week (Tate 1976a). Late last century much higher rates of one shilling and six pence per hour, or seven shillings and six pence per day were charged by a Kanowna, WA, cycle dealer (KanDem 21/8/97). No records survive to show the extent of cycle hiring.

Bicycles and tyres were advertised widely in cycle journals (Plate 2.5), newspapers, magazines and specialised trade organs (such as the Australasian Ironmonger). Advertisements were placed by national or colonial representatives (such as Dunlop or Massey-Harris) and local cycle shops. Some advertisements were specifically aimed at the rural market (through the Worker, for example), and tyre and bicycle characteristics especially suited to rural use were emphasised. Anthony Hordern & Sons had several pages of their catalogue devoted to cycles and accessories (Plates 2.6, 2.8).

The linking of bicycle advertising to record performances, and the endorsement of bicycles, tyres and peripheral items was common (Fitzpatrick 1978j). It led one writer to note that

when a champion pulls down a record the credit of his victory is claimed by the builder of his machine, the maker of his tyres, the patentee of his saddle, and the manufacturer of his chain. Then the oil with which the chain was lubricated, the toe-clips which kept his feet on the pedals, the shoes he wore, the training oil used by him, the soap he patronised, and the pills which set his liver right, all have a share in the victory. The man himself is little else but a pedalling advertistment (AuWh 1/96:15).

The rides of Australian bush cyclists, particularly the overlanders, were likewise exploited. Several early riders commenced journeys without fanfare or official acknowledgement and the cycle and tyre companies were rewarded with unexpected but valuable publicity. The German 'Electra'

reputation was immeasurably enhanced in Australia after it was disclosed that Jerome Murif used one on the first Adelaide-to-Darwin crossing in 1897. And the Australian Dux Cycle Co. was helped by William Virgin's use of one of their machines for the first Perth-to-Brisbane cycle ride in 1897. The tyre and cycle firms sought out proven overland riders and supported them with equipment and administrative aid for subsequent efforts. Unproven riders likely to succeed were told that official endorsement and reimbursement would be forthcoming only if they were successful -- the companies were anxious to protect themselves against the adverse publicity of a failed effort (ACA 1898:22-23).

The overland rides were particularly valuable advertising because nearly all were made with standard roadster and touring models, which were most commonly bought by the general cycling public. Imported machines used on long Australian rides were sometimes returned to their countries of manufacture; the 'Gladiator' used by Frank White on his 1898 Perth-to-Rockhampton return ride was displayed in Melbourne before being shipped back to France (MorHer 12/10/98:2). To demonstrate their durability, tyres were also exported after having seen heavy use on Australian roads.

Theft was common, as the utility and speed of the bicycle made it highly desirable. During goldrushes on the Western Australian fields, for example, machines were 'borrowed' (Hounslow 1976). Kalgoorlie police warned residents of a spate of thefts in mid-1899 (WACy 9/6/99: 96) and three months later advised that a large number of machines and parts awaited claimants at the police station (WACy 29/9/99:6). A Coolgardie bicycle thief was sentenced to 12 months in gaol (MenMin 12/6/ 97:10) and sentences passed in Sydney were reported in Western Australia (MorHer 29/10/97:2). In South Australia machines were 'used' to ride somewhere and then left (Farley 1977). There were reported Australia-

wide theft rings (AuWh 8/97:262) and bicycles stolen in large cities reportedly ended up in country towns (Argus 23/9/13:10). Numerous locking devices were on the market, and such anti-theft procedures as acid-etching names into frames were suggested (MenMin 18/12/96:14).

II. Technical Matters

'... undoubtedly a clever piece of mechanism'.

(Wallis 1897:1)

To appreciate the use of the bicycle in rural Australia it is necessary to understand the technology of the machine itself. Several aspects of bicycle technology are discussed in subsequent chapters in appropriate contexts; the freewheel, saddles, handlebars, toe-clips and riding position are considered in Chapter 3, and brakes, wheels, and tyres are given comprehensive sections in Chapter 4. Other facets of the machine are discussed in the following pages, along with comments upon the perception of the bicycle and its potential for rural service.

In summary, the safety bicycle as commonly used in rural Australia was a relatively light, steel, diamond frame machine with tangentially spoked 28 inch (71 cm) wheels, roadster or thorn proof pneumatic tyres, a fixed wheel, a well sprung saddle, possibly a plunger brake on the front wheel, and occasionally a rear mudguard. After 1900 the freewheel came into use along with a backpedal brake on the rear wheel.

The Frame

'This ride again illustrates the marvellous perfection to which the up-to-date safety has been brought, when a 28-lb. bicycle is capable of carrying its rider almost around Australia without injury'.

West Australian Sporting Judge and Wheelman (30/7/98:8) commenting upon Frank White's Perth-to-Rockhampton return cycle journey.

In the early days of safety use different shaped frames were introduced into Australia. Variations of the diamond frame design were ridden by Armstrong and Craig from Croydon, QLD, to Sydney in 1893 (Plate 5.3). By the early 1890s the Humber version of the diamond frame was established as the world and Australian standard. Although in those days some thought otherwise (Austin 1896:138), the diamond frame has shown itself to be a 'very nearly optimum shape for bicycles which assures good distribution of material, minimum weight, and (less obviously apparent) low wind resistance' (Whitt 1974:198).

Diamond frames are remarkably strong. An advertisement of the 1890s, for example, showed a roadster supporting 16 men with an aggregate weight of 2,448 pounds (1,110.4 kg) (Plate 2.7). The theme was repeated by other cycle manufacturers (Bul 2/10/97:24). Whitt (1974: 194) reports tests of a steel diamond frame carrying 2,925 pounds (1,326.8 kg) on the crank bracket before permanently deforming, collapsing only at 4,172 pounds (1,892.4 kg). It supported 4,275 pounds (1,939.1 kg) on the saddle pillar, collapsing at 5,438 pounds (2,466.7 kg); and withstood 2,600 pounds (1,179.4 kg) force along the chainwheel line before collapsing. Claims that bicycles could safely carry '25 stone' (Plate 2.5) were not an exaggeration. The light frame and wheels were understandably a source of admiration and wonderment to early viewers and users of the design (W.F.L. 1897:82; WASpJ 30/7/98:8).

Nearly all bicycles had steel frames. The occasional American aluminium frame was seen in Melbourne, but there was concern about the difficulty of repairing the metal (AuWh 1/96:25), although at least one Victorian cycle builder claimed to have had some experience with it (Bond 1896a). Aluminium cycle accessories, however, such as toe-clips (WAWh 1/10/97:16) were commonly available (AuWh 2/96:43). A variety of bamboo frame bicycles were built abroad (Sharp 1896:287; Ritchie 1975: 171) and one was sold in Perth (WAWh 11/12/96:6). Despite the interest they aroused, bamboo and aluminium bicycles were mere curiosities on the Australian cycling scene.

The early bicycles were very light (Table 2.3). Advertisements of the period listed total machine weights of only 24 to 29 pounds (10.9 to 13.2 kg) for roadsters and touring bicycles, within the range mentioned by Thompson (1976) in his discussion of antique cycles in Australia. Coleman used a 24½ pound (11.1 kg) 'Osmond' on the second Darwin-to-Adelaide ride, for example (AuWh 10/97:335), and 22½ pound (10.2 kg) racers were ridden occasionally in the Menzies, WA, area (MenMin 10/6/99:12). The 'Syracuse' heavyweight model ('The fat man's wheel ... for riders up to 25 stone' (158.8 kg) (AuWh 10/96:310)), weighed only 27 pounds (12.2 kg). Taylor (1978) said that the first and most important question he and other shearers would ask about a bicycle was 'how much does it weigh?'; they generally would not consider one over about 26 pounds (11.8 kg). Many cycle shops had scales convenient for weighing machines.

The above weights did not usually include mudguards or lights, and often no brake. However, an 'Electra' now in the Woolpack Inn Museum, Holbrook, NSW, weighs only 26.5 pounds (12.0 kg), including a rear mudguard and plunger brake. Surprisingly, this is less than any of 12 popular 'lightweight' touring bicycles now sold in Australia that were

Table 2.3
 PART-BY-PART WEIGHT OF A LIGHT ROADSTER: 1899
 (AuWh 3/99:79)

	lbs	oz	kg
Frame (24 inch - 61 cm)	6	0	2.72
Front forks	1	15	.88
Head, lug and bolt		4	.11
Handlebar	1	3	.54
Saddle and pillar	1	15	.88
Brake (plunger)	1	2	.51
Tyres (Dunlop 1 5/8" X 28")	3	13	1.73
Rims	3	2	1.42
Spokes and nipples		10	.28
Hubs	1	4	.57
Axles, cones and cups		10	.28
Ball bearings		2	.06
Cranks and cotters	1	4	.57
Rat-trap pedals	1	3	.54
Chain	1	1	.48
Sprockets	1	3	.54
Nuts, step, etc.		5	.14
Total	27	0	12.25

reviewed in Choice magazine (9/76:290-297) (Table 2.4). While the modern bicycles all include gearing systems and handbrakes, even without these items several of them would weigh more than many early bicycles.

Chainless bicycles enjoyed a brief vogue in the cycling world (Woodforde 1970:106; Ritchie 1975:166). One variety used an additional large sprocket between the front and rear cogs in lieu of the chain. A version of this, the 'Triad', was built and used by an Australian (AuWh 9/98:282), but never manufactured. The other important variety of chainless bicycles employed a drive shaft in lieu of the chain, with bevelled gears at each end. The American 'Columbia' was of this design, and was the most commercially successful in the world; some were sold in Australia ('Columbia' 1899). One Melbourne group built a chainless machine known as the 'Love' (after one of the inventors -- Love, Cohen and Rubenstein). The details of the driving mechanism are not clear, but the machine weighed only 26 pounds (11.8 kg), had a two-speed gear, and allowed freewheeling (AuWh 8/97:251). Goldsbrough, Mort and Company attempted to establish the Ake-Ake Chainless Bicycle Company. Using an apparently Australian design (Ake 1896b), they negotiated with an English manufacturer to have a prototype built, but because of cost and management problems (Ake 1896a) the machine was never made (Ake 1897).

Chainless bicycles were advocated for several reasons. Some felt that the traditional chain-and-cog arrangement was a nuisance when dirty (Law 1896:258). Others thought chainless machines were safer since chains came off on occasion. Manufacturers saw the machines as a possible salvation for declining cycle sales in the late 1890s; if the public could be convinced that chain bicycles were 'obsolete', the market would be open for further exploitation. However, the principal problem with chainless machines is that a slight misalignment of the frame causes considerable friction or even binding of the gears. As one writer noted,

Table 2.4
WEIGHT OF CURRENT 10-SPEED TOURING CYCLES
(Choice 9/76:290-297)

Manufacturer/Model ¹	Weight		Extra Items ²
	Kg	Lbs	
Viscount Sebring	12.50	27.50	
Swift Clubman	12.90	28.38	P
Raleigh Scorpio	13.35	29.37	$\frac{1}{2}$ M P
Peugeot Sports Tourer	13.55	29.81	C L M R
Oxford International	13.70	30.14	B $\frac{1}{2}$ M
Toyosha SD27S	14.40	31.68	C S
Bennett Supersport	14.65	32.23	B C $\frac{1}{2}$ M P S
Porsche Racemaster	14.80	32.56	B C M
Eaton's Tru Line Competition	14.95	32.89	C $\frac{1}{2}$ M
Myer Speed	15.10	33.22	B C
Walton's Free Spirit	15.20	33.44	C M P S
Malvern Star Super Star SL	15.40	33.88	B C M P S

¹All models have 10-speed derailleur gearing systems, dual caliper brakes, and (except for three) reflectors.

²The following items are included in the cited weight when indicated.

B - Bell

C - Chainguard

L - Light and generator

M - Mudguard ($\frac{1}{2}$ M = half-sized mudguards)

P - Pump

R - Luggage rack

S - Sidestand

chainless designs are 'essentially unfit for a frame which must, in the highest degree, be flexible and elastic' (AuWh 10/97:311). In contrast, the roller bearing chain can achieve an efficiency of up to 98.5 percent in energy transmission (BBC 1973); even when dirty and misadjusted it is still very efficient.

Mudguards were not a standard accessory on Australian bicycles. The aridity of much of the continent led local (MorHer 27/4/98:2) and foreign observers to comment on the fact that they were not essential; their weight, cost and potential maintenance and noise problems made them a liability for the most part. Where rainfall was greater many machines were fitted with them (Riley 1976), but often only on the rear wheel.

Gearcases were developed to enclose the chain and gears: they excluded dust, grit and mud and provided an oil bath (Sharp 1896:161). Their use ostensibly meant less friction and prolonged chain life, quietness, and less frequent adjustment of the chain. However, machines fitted with them could not be laid on their sides or turned upside down without losing oil (Garratt 1899:158-160). Australians complained that they were expensive (AuWh 2/96:48), heavy, a general nuisance, unsatisfactory in practice, and inartistic (!); the Australians, like the Americans, were not inclined to use them, in contrast to the British (AuWh 12/96:359).

Maintenance and Repairs

'... you can tell how a man treats his wife by the way he looked after his bicycle ...'

(Farley 1977)

A factor greatly contributing to the bicycle's popularity and utility was that it required very little maintenance; indeed, it was

generally considered 'a bad thing to be constantly tinkering with one's cycle' (AuWh 9/96:249). Where necessary, repairs could often be done without elaborate equipment or parts. When components were beyond repair, substitutes were frequently satisfactory, at least temporarily. Even when damaged, a bicycle could be ridden in surprisingly 'poor' condition, and was often still a more energy-efficient form of travel than walking. And if too damaged to ride, pushing a cargo-laden bicycle was still preferable to carrying the load on one's back.

Aside from tyres, lubrication was the principal concern in bicycle maintenance. On many bicycles oil (inserted through small capped openings in the hub), rather than grease, was used for the axles and bearings. In heavy sand and dirt some cyclists frequently cleaned the hubs with kerosene and replenished the oil (Murif 1897:25); others gave them little attention. Oil and grease (occasionally 'borrowed' from windmills) were commonly used on the chain, but they were messy, collected dirt, and were felt by some to be deleterious to the tyres. Alternatives such as graphite (WAWh 19/11/97:19) and tallow were popular, but Witt (1977), who used the same chain for nearly four decades in rural Western Australia, found that graphite required a little oil mixed with it for the most effective use; he preferred candle grease.

* * *

A damaged bicycle was almost always an inconvenience and in isolated areas could prove fatal; travellers had to be prepared to repair the machine. Rural cyclists usually carried basic tools and spare parts -- tubes, patching kits, pumps, chain links, spokes, pieces of wire and cord, and a 'standard spanner that fitted any nut on the bike except ... the rider' (Beer 1977).

Frame members occasionally cracked, bent or broke completely, but because of the geometrical structure they could usually be temporarily

repaired. Wooden splints could be fitted and local station blacksmiths could join tubes (Keatley 1977). An excellent description of repairing a collapsed frame with 'No. 10 gauge fencing wire, a saw, a strong pair of pincers and a piece of hardwood batten' was given by Gainford (1899a: 164-165); a series of bindings and stays carried out at Michelago, NSW, enabled Gainford to bicycle on to Jindabyne and eventually to the top of Mount Kosciusko.

The front forks gave the most trouble. Although one sustained 3,544 pounds (1,607.6 kg) of horizontal force in a test (Whitt 1974:194), they are supported only at the crown. As they are subjected to tremendous blows and torsion in rough country, it is not surprising that they broke at times. Apart from punctured tyres and broken or bent cranks, damaged forks were probably the most common and serious technical problem facing cyclists; several riders died from injuries sustained as a result of collapsing forks (Argus 13/1/11:8, 13/5/11:17).

Forks were temporarily repaired with saplings, hoop iron and wire, for example (WACy 7/7/99:13), often well enough to ride for long distances; one group on the Strzelecki Track in 1909 repaired a broken fork by inserting a stick in the tube (Keatley 1977). A temporary repair on A.B. Mather's broken fork south of Elsey Station, NT, held for 55 miles (88 km), but eventually collapsed and he had to walk 25 miles (40 km) for assistance (AuWh 9/97:294). Another rider managed to pedal about half the distance to Coolgardie from Perth with a splinted front fork (WAWh 20/5/98:14).

The reinforced fork on the Anthony Hordern bicycle (Plate 2.8) was a definite improvement in terms of strength. Bicycles intended for carrying heavy loads, such as North Vietnamese cargo bicycles (Australian War Memorial, accession number 40136) and others (Wilson, S. 1977:38-39; Ritchie 1975:176-177) are often similarly reinforced. Lenz, the American

who, in 1894, attempted to cycle around the world, used a machine with a reinforced fork (Smith 1972:176). However, throughout this entire study only one reference other than Hordern's catalogue -- a photo of a Darwin-to-Adelaide cyclist (Plate 6.3) -- has been found to suggest the reinforcing of forks in Australia.

Chains broke occasionally. Denning, on his overland effort of 1898 had to walk 45 miles (72 km) to Frasers Range, WA, for example, after his snapped (MorHer 25/4/98:2), and Richardson had two breaks in heavy mud near Mullewa, WA, during the first around-Australia cycle journey (MorHer 16/6/99:2). However, those personally interviewed said that broken chains were not particularly common and personal correspondence and literature bear this out. One Englishman (Garrat 1899:168) summarised the matter well: the 'remarkable part of chain gearing is that it will work, and what more, does work every day in all parts of the country, when in a most deplorable state of filth and neglect'.

Bent pedals were common but could generally be straightened to a serviceable state. Bent or broken cranks were another matter, however, as they required good repair facilities or proper replacement parts. Frank White had to abandon his around-Australia effort at the turn of the century when he suffered irreparable damage to his crank at Pine Creek, NT (Clune 1942:156). Fortunately, this extent of damage appears to have been relatively rare.

Durability

'... in reality it was better than new, since it had been tested and proven'.

Murif (1897:120) commenting upon his bicycle's condition after riding from Adelaide to Darwin.

The bicycles used in Australia were extremely durable. However, until long-term experience was accumulated, there were many conflicting views. An early observer in Western Australia said that with moderate care a machine should last 20,000 miles (32,000 km), or four to six years (WAWh 27/8/97:17). Another writer believed that even though the aggregate distance was the same, a bicycle on a series of long runs would not last as well as on a series of short runs (MorHer 11/9/97:2); he provided no rationale for the comment. Early touring articles often featured the fact that there were no mechanical troubles during long tours in rough conditions, but this eventually ceased to be noteworthy. After many riders had used the bicycle continuously for years without trouble, it became obvious that the machine was more durable than many had suspected. With reasonable maintenance they were capable of running for an indefinite time.

An excellent example of the machine's durability was provided as a result of its adoption by the Melbourne post office for collecting mail from pillar-boxes. After a month's trial bicycles were adopted throughout the city in July, 1898 (AuWh 8/98:243). Massey-Harris contracted to supply and maintain them at a cost of £9 per machine per year. One cycle journal calculated that £2 per year would be a reasonable repair charge per machine; when added to initial manufacturing costs, the journal predicted that the advertising was 'the best part of the bargain' for Massey-Harris (AuWh 7/98:191).

The post office was very pleased with the results. They employed 14 bicycles and 18 men in shifts to clear pillar-boxes, with one cyclist doing the work formerly done by a team of horses, waggon, driver, and box-clearer. The manager of the Melbourne General Post Office Cycle Corps estimated that the bicycles saved £2,000 per year, and by 1905 the estimated savings was placed at £3,000 annually (PSC 1905). Massey-Harris could also rest content. Although each machine averaged 30 miles (48 km) per day, or approximately 12,000 miles (19,300 km) per year (AuWh 10/99:286), total repair cost to Massey-Harris for the first 15 months was only £7-19-0 (£5 of this was for three specific accidents); in terms of wear and tear the cost per machine was only 4 shillings.

The records of the Postmaster-General's Department provide excellent information on the long term durability of bicycles. The machines were widely introduced at the end of the First World War, yet by 1935 no replacement program had been instituted. As many of the bicycles in outback districts had not been into central repair workshops for nearly two decades, concern was expressed that some may no longer be safe to ride. The circumstances of their use were specifically emphasised: they accumulated very high annual mileages; they were ridden in all weather conditions; they carried loads of up to 50 pounds (22.7 kg) of mail; and over half of the machines were ridden every day by two or more cyclists (PMG 1935a). Despite the number of years many machines had been in service, one post office official inexplicably suggested that four years was a 'reasonable life' for a bicycle under such conditions (PMG 1935b).

Eventually an effort was made to assess the situation and establish maintenance and replacement guidelines. In 1940 a directive was issued to each state to repair and recondition 'equal to new' a number of in-service bicycles, and to submit reports on them. The oldest possible

bicycles were to be obtained for the survey. In a pilot survey in Victoria, two of ten machines were scrapped; the remaining eight required repairs, mostly to bent or cracked frame components (PMG 1940).

In Queensland, five bicycles, two issued in 1917, and one each in 1923, 1927 and 1930, were obtained from Longreach. The two oldest were scrapped, but the 1923 machine, then 17 years old, was described in 'good order', and although the chain, chain wheel, cog wheel, pedals and spindle crank were 'well worn', they were still 'satisfactory'. The 1927 model required only the replacement of one nut. The 1930 machine's frame, cups, and crank bracket and spindle were in excellent condition, and the pedals and chain were 'well worn but satisfactory' (Weeks 1940).

In New South Wales, five machines were obtained from country towns, two issued in 1918, two in 1919, and one in 1922 (Barrow 1940). Although axles and bearings were replaced on all of them, in accordance with the directive to make them 'equal to new', in fact the 'wear in the replaced parts did not interfere with the efficiency of the machine (Hammond 1940); in effect the 'repairs' need not have been undertaken, despite a mean of 20.8 years service for the five bicycles.

In summary, the 20 surveyed machines for which records survive had been in service for periods ranging from 10 to 23 years, but only four were scrapped. The rest were generally satisfactory and all, even the scrapped ones, had been in regular daily service. This is all the more remarkable when the likely mileages are considered. Given an average delivery route of 10 miles (16 km) per day (McCallum 1976), ridden twice a day for six days a week, a machine would have covered more than 6,000 miles (9,600 km) per year. The total mileage of the older machines was probably well over 100,000 miles (161,000 km).

This kind of evidence raises intriguing questions concerning the

durability of past and present bicycles. Wilson (1968:258-259) states that the reliability of modern bicycles is very poor, and in terms of maintenance Whitt (1974:223) feels that the 'present design is attuned to the low-labor-cost conditions of an earlier age'; cup and cone bearings on current machines, 'made of inexpensive steels, inaccurately constructed, and little protected from grit' (Whitt 1974:143), will probably need to be replaced after 1,000 hours. This is in great contrast to the PNG experience and Riley's (1976) comment that with decent care he expected machines sold in the 1930s to last for several decades before needing those parts replaced. Whitt's and Wilson's estimates of the durability of modern bicycle components need checking -- are modern machines so inferior to older bicycles, or are Whitt and Wilson simply wrong?

While it is beyond the scope of this study to compare modern and early bicycles, correspondents and interviewees often reflected Fisher's (1977) feelings. Modern bicycles

are not a patch on their predecessors that were made in this country in the 20s and 30s. Today they are ... of inferior metal and materials and reliability. The cycles of the 20s and 30s were strong, reliable, and good workmanship and were built to last a long time. They had to be to carry heavy weights over long distances and over very, very rough terrain in all seasons and in all weather.

An active member of the Australian cycle industry for nearly six decades, in an off-the-record interview, said that bicycles definitely are not as well built today as when he started, but 'they are good enough' for the conditions under which they are now used. Based upon many years experience in postal delivery service, McCallum (1976) believes that the standard of everything -- parts, tyres, metals -- is going down. Given the previous performances of post office machines this is a sad situation,

more so because it has led to discussion about the possibility of throwaway plastic frames being used in place of the maintenance demanding ones currently in service (Finch 1976) -- a tragic comment upon the 'progress' of cycle manufacture over the decades.

Silence and Oddities

The silence of the bicycle was occasionally significant for bush use. The vibration-absorbing nature of the pneumatic tyre and the simple mechanical construction of the machine minimise noise and the transmission of vibrations to the ground. This left cyclists in the occasionally unfortunate situation of riding over unwary snakes, several reports of which exist. Murif's (1897:46) first such encounter resulted in a severe fall, brought about by his surprise and efforts to dismount prior to hitting the snake. He subsequently found it much simpler to merely lift his legs. Jeffery (1977) had a snake flung onto his bicycle by the front wheel while patrolling the Kalgoorlie pipeline. Crawford (1976) reported that the silence of the bicycle made it ideal for riding about paddocks during the lambing season, as he could approach ewes without disturbing them. Witt (1977) found the silence advantageous while kangaroo shooting from the bicycle, and the Kalgoorlie police used them occasionally during rural investigations because motorcars could be heard for miles (Costello 1977). Pedestrians had contrary opinions, however, and letters-to-the-editor complained about cyclists silently riding up behind them and passing by while ringing their bells (KalMin 2/8/97:2).

There were a variety of odd machines conceived, designed or built for use in the rural Australian countryside. Austin (1896:138-139), for example, developed and used for some years a 'hill-climber' bicycle, on which the seat was located further forward than normal. During uphill pedalling the rider remained seated over the pedals, where he could apply

his power more efficiently; unfortunately, on level and downhill runs the rider was well forward of the pedals.

A few wooden bicycles were built (MorHer 19/8/97:2) or designed (CyGaz 2/12/98:447). One now in the Western Australian museum was made with mulga-wood forks, wheels of solid wood, tin tyres, and a 'chain' of bullock hide, with holes for the sprockets (Summerfield 1977); although Dunsford (1900) reported that the machine was ridden from Southern Cross to Mount Barker, WA, a cursory examination of the crude construction and great weight makes the account highly implausible.

And last, but certainly not least

Another Australian (a retired hunting man) has invented a machine which will jump any ordinary post-and-rail fence. He has merely to touch a knob, when two strong light steel springs are released which, striking the ground just behind the front wheel, chucks the machine and rider into the air, and if he has been going at a good bat, and releases the spring at the correct moment, he sails over any obstacle not more than five feet high. The shock of landing replaces the springs in their original position, and is ready for the next fence (AuWh 4/97:122).

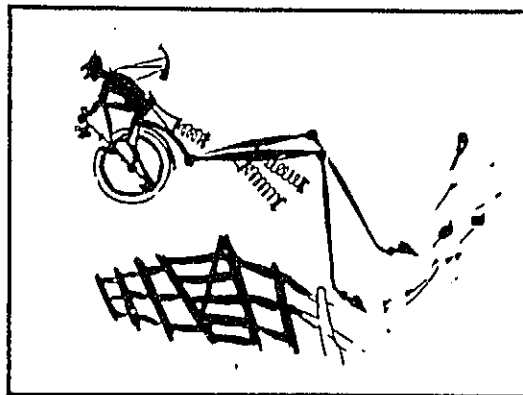
The idea occurred to others as well, as an illustration from an English cycling book indicates (Figure 2.3).

* * *

An important aspect of the bicycle of the 1890s was its great versatility. The same machine was used for rural work, urban commuting, track and road racing, church parades, courting, military purposes, and as a purveyor of social status. There was little variation on the basic design, and the few accessories could be fitted or altered readily. Dealers did not have to stock a wide range of styles and equipment to anticipate trends or to cater to specialised markets. Today there is a multiplicity of bicycles and equipment with varying riding characteristics and performances: 'banana', 'high-riser', roadster, touring, road racing,

track racing, folding, sprung, cross, and plastic frames; varying wheel sizes, alloys, and numerous shaped and treaded tyres of differing cross sections; and several gearing and braking systems. But the limited selection of those days was a blessing in one important respect: even if the individual rider could not choose among a wide variety of machines to 'optimise' his own riding performance under given conditions, at least society as a whole had widely available a machine that could serve nearly everyone to a reasonable extent. When a cycle dealer or chemist -- whether in Melbourne or Mount Magnet -- stocked a bicycle, he catered to the transport needs of many. The first mass-produced personal transport device indeed served the masses; the same design suited the shearer or rabbit fence patrolman as well as the social dilettante.

Figure 2.3
A FENCE-JUMPING BICYCLIST
(Pemberton 1897:94)



Chapter 3
'BICYCLING'

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'Bicycling'

'It is a wonderful machine, which the rider can carry, and yet can carry its rider 60 miles between lunch and dinner'.

(Woodhouse 1895)

'Bicycling' represents an interaction between man and machine.

The bicycle is the mechanical component -- it enhances the production, transmission and utilisation of energy. Man is the highly versatile power source, the human engine. The combination can result in a sustained rate of travel not possible with any other form of animate power; for over two decades 'bicycling' enabled a man to travel across the Australian continent faster than by any other form of personal transport.

The bicycle is an aid to personal movement. Although 'riding a bicycle' is the usual image of cycling, negotiating parts of rural Australia involved far more. The rider often had to get off and walk. When sand, mud, water or other obstacles made the machine unusable, the man could dismount; he could push it, carry it, lift it over fences, and swim it across rivers. Mode could be matched to terrain, optimising the energy efficiency of both wheel and foot. As well, man and machine could be readily carried on a waggon, truck, car, boat or train. The combination embraced a wide range of speeds, weight carrying capacities, and energy efficiency. The utility, lightness and transportability of the machine greatly expanded the dimensions of personal travel in rural areas.

Energy Efficiency

'... bigger prices, more exotic names and 10 speed gears ... the power unit is still the same ...'

(Beer 1977)

To compare the relative efficiency of forms of transport, Tucker (1975:414) has measured and defined the 'cost of transport' as 'the energy

expenditure per unit weight of an animal moving at a given speed on a level path for a unit distance'. By his definition a walking man is reasonably efficient (Figure 3.1). Wilson (1973:82) indicates that a walker at his most efficient rate uses some 0.75 calorie (3.14 J) per gram per kilometre. The efficiency depends upon speed however. Tucker (1975:414) indicates that the lowest rate of energy expenditure for a 154 pound (70 kg) man is at a velocity of 3.85 miles per hour (6.2 kph). A change in speed (up or down) decreases the efficiency.

A bicyclist is far more energy efficient than pedestrians or runners. Wilson (1973:82) says that a cyclist at his most efficient rate consumes only a fifth the energy of a walker to cover a given distance, that is, only about 0.15 calorie (0.63 J) per gram per kilometre. Tucker (1975:414) gives a slightly lower efficiency figure, indicating that the minimum cost of transport for a cyclist is about a fourth that of a walker. According to Wilson (1973:82) a man on a bicycle is the most energy efficient of all travelling animals. Tucker (1975:414) qualifies this by saying that while the cyclist has the lowest cost of transport ever directly measured for an animal, the minimum cost-of-transport line (Figure 3.1) for swimming animals suggests that large fishes and whales may do better.

Wilson (1973:82-83) outlined the basic reasons for the greatly increased efficiency of the cyclist. Ergonomically the machine utilises the riders' thigh muscles, the most powerful, through a rotary motion of the feet; the machine then transmits the power by pedals and cranks through a very low-friction, geared chain-and-bearing arrangement to a low rolling resistance pneumatic tyre. The lightness of the bicycle means that the energy transfer occurs at a relatively low cost in terms of additional weight that a cyclist must lift up a hill or accelerate on the level.

Why a sitting, rotary-motion pedalling action is so efficient has been discussed by Tucker (1975) and Wilson (1973). First, muscles must expend energy when in tension, whether doing work or not. (By definition work involves the movement of a mass through a distance (Resnick 1960:112). Hence, a standing person, although expending energy, is doing no work). The cyclist saves some energy because in sitting on the seat his leg muscles are not involved in supporting the body. Secondly, in walking the muscles have to accelerate and decelerate the legs and raise and lower the body. This requires the contraction of opposed sets of muscles to start and stop the swing of various parts of the limbs; considerable energy is thus expended not in thrusting the body forward, but merely in placing the feet and legs in the proper position to begin the forward movement. The cyclist, in contrast, has only a limited amount of reciprocal action, mainly the knees and thighs. The back and forth swinging of the legs during pedalling does not appear to result in any significant loss of power (Whitt 1974:31).

The bicycle, then, is not just a device for multiplying a human's energy output, but actually allows an increased muscular efficiency; a greater proportion of the rider's effort is used to directly move himself forward. Tucker (1975:416) says a cyclist is capable of attaining a muscular efficiency of 0.25. Whitt (1974:30-31) indicates a maximum measured net muscular efficiency of 0.27, based upon oxygen consumption tests. The remainder of the expended energy is dispersed as heat. Graphic evidence of a cyclist's capability with respect to a runner is provided by a comparison of high speed performances. Whereas the fastest cycle racer averages 13.01 metres per second for an hour (46.85 kilometres) (McWhirter 1977:264), the world's fastest runner can average only 10.08 metres per second for only 19.83 seconds (200 metres) (McWhirter 1977:326).