



Early Australian automotive design 1895 - 1953

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Norman Arthur Darwin

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Certificate of Business Studies: Personnel

South Melbourne Institute of Technology

School of Architecture and Urban Design

College of Design and Social Context

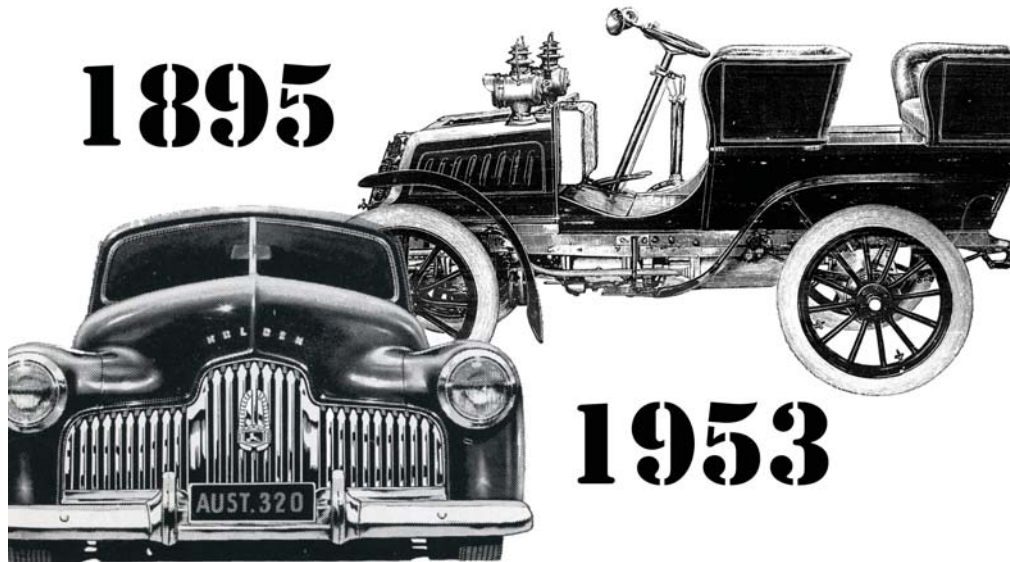
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This dissertation is submitted for the degree of
Doctor of Philosophy

Supervisors:

Professor Harriet Edquist

Doctor Judith Glover

Doctor Areli Avendano

For Heather

Design is where science and art break even.

Robin Mathew

20 June 2018

Declaration

I certify that except where due acknowledgement has been made that this dissertation is of the author alone; includes nothing, which is the outcome of work done in collaboration except where specifically indicated in the text; has not been previously submitted, in part or whole, to any university or institution to qualify for any degree, diploma, or other qualification; that the content of the dissertation is the result of work that has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and that ethics procedures and guidelines have been followed.

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Norman A Darwin

Early Australian automotive design 1895-1953

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ABSTRACT

The aim of this research is to reveal new knowledge about one of the most significant Australian industries of the twentieth century, the automotive industry. In particular, it provides the first comprehensive account of the origins and early development of Australian vehicle design from the 1890s to the 1950s. Furthermore, by incorporating automotive design into the broader field of Australian design history, it paves the way for the future development of this field of research.

An extensive literature review highlighted the gaps in the published accounts of the Australian automotive industry in relation to automotive design. For the early period covered by this thesis almost no research has been published on local design efforts. The general consensus is, that Australia received its ideas from overseas. Extensive archival research and re-examination of the early primary publication record however, have found this not to be true and that it is possible to trace a history of design in the period relevant to this thesis.

The thesis is structured chronologically and identifies five periods where local design can be discerned using Adrian Forty's definition of design as the conjunction of the visual with the instruction. Early inventors, tinkers and builders up to WWI (1895-1916) provided the grounding in automobile design using both borrowed technologies and new concepts that proved to be significant. Opportunities that arose from an embargo on imported bodies (1917-1922) led new industries to mass-produce a standardized motor body and several post-war cars, a few using new ideas and construction methods.

The development of the first design centres (1923-1929) and formal links with overseas motor companies witnessed a transfer of technology that resulted in local design equalling international design. The financial collapse of the depression saw American companies consolidate their Australian positions (1930-1939), leading to new management, variations and unique body styles.

Opportunities afforded by WWII to design and produce an Australian mass produced car, principally the Holden (1939-1953), reveals unrecognised expertise Australian designers had developed previously in the Holden's body design.

The outcome of this research is the first scholarly account of early Australian automotive design during its formative years. The research provides a chronological narrative of this design development and uncovers the names of many unknown or neglected Australian designers. At the same time, it has identified a number of previously unrecorded Australian automobiles. The thesis also explores the contribution of individual component designers, many of whom produced internationally successful automobile engines, transmission systems and suspension parts.

Appendix I identifies and lists all the cars that are true Australian efforts, clarifying and expanding previous incomplete lists and providing a documented basis for future research. Appendix II provides short biographies of the key designers discussed in the thesis.

Introduction

In 2015 Harriet Edquist and David Hurlston curated *Shifting Gear. Design, Innovation and the Australian car*, at the National Gallery of Victoria.

During her research for the exhibition, Edquist contacted me for advice on the early history of the Australian automotive industry, as she had read my history of GM-H (1983), and Ford (1986). Assisting Edquist in this project, I began to crystallize thoughts on Australia's automotive designers that had begun to surface in 2010 when my sixth book on Australian cars, *Monaro Magic* was published.

My interest in all things automotive perhaps can be traced to time spent as a lad in and around the Darwin BMC dealership in Adelaide and to a love of history, fostered by a grandfather who collected history books, and made scrap books and personally bound journals. In 1969, I began at GM-H and worked there for 15 years in the engineering and finance departments. Soon after leaving I published my first book on Holden, *The History of Holden Since 1917* (1983). This was followed by *The History of Ford in Australia* (1986). These studies, the first of their kind in Australia, were company histories that relied on archival research, company records and my own collection of automotive literature. In 2002 came 100 Years of GM in Australia where I outlined a history of all GM products on sale in Australia between 1902-2002 and, in 2010, on a commission, wrote *Eclipse Era*, a history of Ford dealers, Eclipse Motors. In *Monaro Magic* and *Torana Tough*, my last two books, I looked more closely at design origins, style and some of the people, who, like Leo Pruneau and Phil Zmood, were heading up the Holden design studio.

It was clear from my own knowledge and the research uncovered in the *Shifting Gear* project that an understanding of Australian automotive design was limited, even though publications on the local industry run to hundreds of titles. My initial intention for the doctorate was to focus on the GM-H design contribution to the first Holden; however, I soon realised the car's design origins could be traced back to 1923 and designers from this era were influenced by much earlier design practice. To clearly understand Australian automotive design history it was thus necessary to chart the development of the automobile in Australia from its beginnings in the mid-1890s.

Research Objectives and Methodology

The primary objective of this research has been to discover the origins, development and significance of Australian automotive design from the late nineteenth century to the 1950s. Its secondary objectives have been to situate design as a central element in Australian automotive history and automotive design as a significant component of Australian design history.

In framing this thesis as a history of the early development of Australian automotive design I have used a qualitative research methodology in that I examine why and how Australian automotive design developed between the years 1895 and 1953. I explore not only the relevant automotive vehicles themselves, but also the industrial, social and education systems that supported and facilitated their design and construction. By focussing on design my intention has been to construct a history of this Australian industry that has never been attempted before but also to broaden our understanding of Australian design history more generally. To this end I conducted an extensive literature review that encompassed local and international scholarship on automotive as well as general design history.

My approach is grounded in the study and interpretation of primary sources, many of which have never previously been the subject of research. These include archival material held in State and university depositories, local council libraries, automobile club libraries, regional museums and collectors' holdings. For research of this nature the automobile itself as well as its components, such as the engine or chassis, were considered primary sources and I investigated extant vehicles where they existed and photographs, written descriptions and relevant patents, where they did not.

In addition, I used semi-structured interviews with designers, their descendants and other people relevant to my research aim to gain an insight into the design process or to the life of a former designer. A list of interviewees can be found on page 381. This method allowed me to combine pre-determined questions with freer and more exploratory conversations with the interviewees.

Thesis structure

The thesis is structured chronologically from the mid-1890s when the first automobiles were designed in Australia to 1953 when the FE Holden design was completed. It comprises eight chapters. Chapter one reviews the literature pertinent to automobile design, both internationally and locally. As very few local design histories exist the review is broadened to include general history. A summary of design definitions is discussed with relevance to automotive design. Chapter two Places the early Australian automobile development in context with overseas progress, exploring the development of Australia's industrial capability. The chapter also investigates the first Australian designers and specifically those who manufactured the first marketable cars. Chapter three focuses on the birth and growth of the motor body building industry, construction methods, training and the role of the first body designers. Chapter four reviews the impact of World War I on the fledgling automotive industry. Chapter five examines several Australian automobile car and parts designers who produced product between 1919 and 1930. Chapter six discusses the rise of the body building industry after 1917 and the influence of the American manufacturers on Australian vehicles. The chapter also explores the emergence of engineering design at Holden Motor Body Builders after WWI revealing Australia's first design centre and the designers who operated it, proving Australia had talented automobile designers, who were able to produce innovative body styles unique to Australia. Chapter seven focuses on the development of automobile drafting and styling at Holden and Ford between 1926-1938. Chapter seven This chapter also examines the local manufacturers who established businesses after the war, their design origins, execution and success or failure. Chapter eight investigates the unique contribution made by the Holden design team during development of the 48-215 Holden at both Fishermans Bend and Detroit.

Two appendices follow that provide detail of Australian automobiles designed and produced between 1900 – 1950 (Appendix I) and biographies of selected designers who operated between 1920-1953. (Appendix II)

Statement of new knowledge and significance

This thesis provides for the first time a comprehensively documented account of the early development of automotive design in Australia. Its significance lies in the thoroughness of its primary research and in the discovery that design, previously assumed to come from overseas, was an important element of the local automotive industry. Additionally, it provides the basis for the future inclusion of automotive design in the general history of Australian design.

Chapter 1:

Automotive design. A review of evolution and practice

A review of automotive literature

The review of the relevant literature for this thesis has been divided into two sections. The first section covers literature contemporary with the cars included in my research while the second section deals with later literature. This in turn is divided into the literature covering the history of international automotive capability, the history of industrial design and lastly Australian automobile and design literature.

Contemporary international literature

Texts and journals specifically catering to the automotive industry appeared from the turn of the 20th century and provide valuable contemporary evidence of design thinking. To understand the development of the automobile from its beginnings, the detailed work of William W Beaumont, *Motor vehicles and motors. Their design construction and working by steam, oil and electricity* (1900), is essential.¹ Recently reprinted in a 2-volume set, the work provides detailed descriptions, photographs and engineering drawings of all the early automobile designs.² Even earlier there is a French volume by Dick Farman, *Autocars – Cars, Tramcars, And Small Cars* (1896) that provides illustrations, text and formulae necessary to produce heat engines, transmissions and suspension systems for powered road and rail vehicles.³ The monthly journal of the (British) Institution of Automobile Engineers, *Proceedings of Session*, (1906-1947) covered all aspects of mechanical and body automobile design with a focus on mechanical development.⁴ Two British journals, *The Motor* (1903-1988) and *Autocar* (1895-current) published articles on trends in automobile design and both were on sale in Australia from the 1900s.⁵ Of more importance are however, the publications of American body designers, George Mercer, Raymond Birge, Hugh Sargent, Kingston Forbes, and Englishmen, Herbert Butler and Sydney Page who described in detail the practice of designing and building a motor car body.

Birge and Sargent's (1912) *Practical Problems for Vehicle Draftsmen and Mechanics* outlined the practice of Andrew F Johnson, considered to be the father of American automobile design.⁶ Forbes, technical editor of *The Vehicle Monthly*, published a series of drafting and construction courses between 1918 and 1921 and *The Principals of Automobile Body Design* in 1922.⁷ Mercer published several articles in both America and Australia, before producing the *Motor Body Engineering* in 1928. He provided sufficient information to produce every part of a motor body, making it a valuable reference for Australian motor body builders. Mercer continued to be published in Australia through the early 1950s providing designers with new methods and practices.⁸ Butler's *Motor Bodywork* (1924) contained 50 blueprint body drafts and hundreds of illustrations, both drawings and photographs, for all types of motor chassis. Page's publications include a section on modern motor body drafting.⁹ The work of Mercer, Butler and Page were well known in Australia, providing curriculum material for body building teachers, students and craftsmen.

W O Kennington (1934), in a paper to the UK Automotive Engineers, states that present day automobile design developed from the horseless carriage for which he gives some historical background. While Kennington does not comment on early body designers, fellow Institute member, E Beaumont (1937) contends that the first motor bodies just happened and were built by anybody who was handy and unoccupied.¹⁰

An obscure work published in England in 1908 is Ben H Morgan's "Motor Vehicles" in *The Trade & Industry of Australia*. This details Australia's motor trade with some particular notes on the design of automobiles for Australian conditions.¹¹ While it is aimed at the British exporter, the observations and suggestions neatly summarise the engineering and design requirements of an Australian car in 1907.

Contemporary Australian literature

There was lively publication of motoring interest journals in the early twentieth century. The first specific motoring magazine, *The Australia Motorist* (1906), was followed by *The Motor in Australia* (1909), *The South Australian Motor* (1913), *Motor Life in Australia* (1922) and *Motor Manual* (1946-1967) all providing editorial comment and content on both Australian and overseas automobile activity.¹² *The Story of Australian Motoring* (1951) is the only contemporary text that documents early

Australian automobile history by state but draws on the author's personal experience rather than primary sources.¹³

The Cyclist, Tourist & Traveller (1893) added automobile news as and when it occurred and *The Scientific Australian* (1898), a journal devoted to new inventions including horseless carriages under a column, Among the Automobilitists.¹⁴ The only journal to deal with design and construction however was *The Coach builder and Saddler* (1901), later *The Coach builder and Motor Body Builder* (1917)¹⁵ This journal provides a continuous account of Australian automobile design and construction from the beginnings to 1953. Detailed descriptions of motor bodies with drawings, in sufficient detail to enable construction, are provided alongside industry news, participants biographies and overseas trends. This journal is the only continuous account of automobile design in Australia making it an important and valuable resource.

Later literature:

International context: Automotive design and industrial design

The history of automotive design, here or elsewhere, has not until recently been the subject of much research. C. Edson Armi noted in 1988 that: "...good critical writing on the subject of automobile aesthetics is almost non-existent"¹⁶ and was only in 2000 that Penny Sparke published her ground-breaking work *A Century of Car Design*. Here she laments the silence surrounding car designers, noting that except for the well-known Harley Earl, Henry Ford, Norman Bel Geddes, Raymond Loewy, Gordon Buehrig and E T Gregorie, designers tend to be shrouded in anonymity.¹⁷ Sparke sets out to fill the gap by adding Alex Tremulis (Tucker), Virgil Exner (Chrysler), Bill Mitchell (GM), Nuccio Bertone, Ercole Spada (Alfa Romeo) and others.

Sparke argues that automobile design grew from the same urge that inspired artists and architects of the turn-of-the century Art Nouveau movement. This inspiration soon outgrew pure mobility and particularly in America, car owners wanted to be able to outdo their neighbours and use their cars as a means of expressing their fashionable lifestyles.¹⁸

The high fashion of automobiles was led by the French coach builders; what they decreed was followed by coach builders in Britain and the US. When the French coach builders faded the Italians rose to the fore, able to combine this old craft (coach building) with a new approach to mass

manufacturing.¹⁹ Italians, like Giuseppe Merosi, were at the front of the streamlining trend that arose in Europe, producing a lozenge-shaped body for an Alfa Romeo chassis in 1913 that was inspired by the Art Nouveau movement and explored further by Paul Jaray in 1922. As Sparke notes: “By the mid-1930s, streamlining had become synonymous with modern, denoting a look that was associated with glamour, speed, and sensuality”.²⁰

Jaray was the first to reap the commercial benefits of streamlining by utilising a wind tunnel to perfect and then patent a design that in 1934 was reflected in the Tatra 77 car, a style that led to the airline design popularised in the 1930s and adopted by Australian designers.

Sparke refers to Norman Bel Geddes as: “the father of streamlining”. As a visual artist, painter and graphic designer Bel Geddes moved easily into automotive styling, first with Graham Paige in 1928 and later at the GM The World of Tomorrow: Futurama stand at the 1939 New York World Trade Fair. Sparke writes: “Through his involvement with the world of automobiles [Bel Geddes] was able to fully express his visionary ideas and play a prophet of modernity”.²¹ His streamlined sketches from 1932 were used to produce the GM-H logo in 1937. (Fig. 1.1 & 1.2)

The practicality of streamlining is not discussed by Sparke or other design historians; that most of large the automobile manufacturers failed to take up the advantage streamlining provided, suggests manufacturers believed it offered little to the buyer.²² A test in 1936 showed that the V8 Dubonnet streamlined car achieved over 30% improvement in both speed and economy over a standard production Ford V8.²³

Just as Jaray pioneered the streamlining trend, Harley Earl pioneered the concept of automobile styling as we know it today. Sparke suggests the creation of General Motor’s Art and Colour section changed the way American mass producers saw the visual aspects of their product: “His [Earl’s] understanding, not so much of the rational needs of consumers, but rather their deeper emotionally rooted desires, turned the car from a utility object into a popular dream”.²⁴ According to Sparke the Harley Earl hothouse created the designs that made GM the most powerful manufacturer: “Not only did Earl make its cars look good, he also helped define the modern automotive design process, pioneering the use of the two-dimensional rough sketch and full-size clay model”.²⁵

In addition to the American designers, Sparke investigates the German machine aesthetic, the traits of solidity, durability and reliability reflected

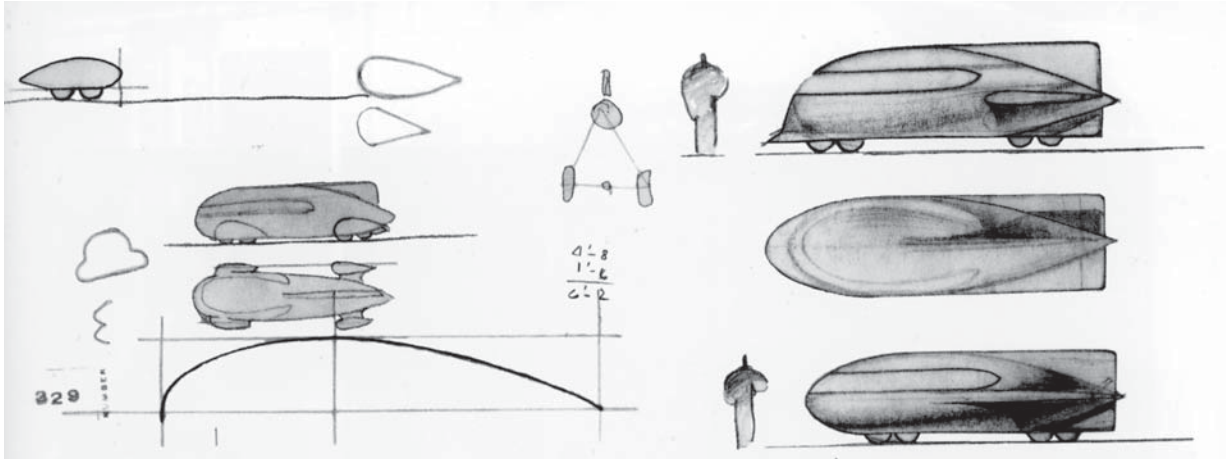


Fig. 1.1
Bel Geddes streamlined sketches penned in 1932 and numbered 8.

P Sparke, A Century of Car Design, 31



Fig. 1.2
GM-H logo developed around Bel Geddes theme 1937.⁶

GM-H

in Mercedes-Benz and BMW cars. She reminds us that the Germans were not without some flair, stating that Karl Wilfert was the first engineer to put the radiator under the hood in 1953.²⁶ It is Italian style, however, that placed Italy as a design leader after WWII. Sparke proposes that:

They learned quickly from the pre-war advances made in both the United States and in Europe, combining them to create a stunning new aesthetic hybrid which, characterized by its long, low, racy, sleek, sculptural forms, came to be known as Italian style.²⁷

Alfa Romeo, Maserati, Lancia, Ferrari and Lamborghini adopted flexible mass-produced systems that permitted models to be created in batches. Sparke argues that not only were the Italian cars aimed at the style-conscious, luxury market, they performed well and had stunningly good

looks. While Sparke includes a chapter on “The far east explosion”, she does not include Australia in her international survey of automotive design. This suggests that Australian automotive design had not yet been the focus of research that she could access.²⁸

Earlier writers who have surveyed and pioneered international automotive design history include Leonard Setright and Reinhard Seiffert. Setright’s *The Designers*, sets out to celebrate European and North American car design, connecting art with body-styling and plays an important role in governing the work of engineers, but: “...reduces them to an individually impotent regiment of faceless, nameless, characterless boffins and bondmen, specialists sitting on a committee”.²⁹

Setright asserts that early designers were indeed engineers; and, as they designed the whole car they were also artists. He laments that: “In a full design sense, it is unlikely that anything ever will be again”.³⁰ Setright also provides a chapter on Bodyshapers, detailing the careers of leading stylists up to 1960.³¹

Reinhard Seiffert’s (1965) *A Miracle on 4 wheels* is a general history of the European motor car with some predictions about the future direction of automobile design. In a chapter on “The Engineer’s Decision” Seiffert explores the tension between the engineer and businessman and the fact that the car is a compromise between the two. Sometimes, however, the results can be innovative such as the Citroen DS 19: “A vehicle literally bristling with unconventional detail”, or the Mini 850 where British Motor Corporation: “Put their trust in the supremely confident ideas of their chief designer”.³²

While Sparke, Setright and Seiffert undertook international surveys, a number of authors have undertaken studies of American automotive design. Among those that were most useful to my research were Michael Lamm & Dave Holls, C. Edson Armi, David Gartman, Walter Boyne.

Michael Lamm & Dave Holls concentrate on the history of North American body development in their 1997 work *A Century of Automotive Style*. They claim styling began to take on a fiscal importance as early as 1901 as wealthy car buyers considered how his or her new toy would look in the driveway and if it complemented their personality.³³

A Century of Automotive Style was the first serious attempt to document the history of an American commercial or industrial art form related to the automobile and it details the development of the drafting expertise

needed for automotive design, the only modern automotive design book to do so. Lamm & Hollis clearly divide the role of the engineer and the designer/stylist, arguing that many significant design features, or styling determiners could not occur until the engineer solved the technical problems.³⁴

C. Edson Armi (1990) sets out to investigate American styling as an art, but not to separate art from design by dividing the substantive from the decorative and the gratuitous from the functional.³⁵ Armi interviewed eight of America's foremost practitioners, including GM's Bill Mitchell and Frank Hershey, both of whom had considerable influence on Holden styling after 1946.³⁶ Armi also provides an insight into the GM Art and Colour section and the influence Harley Earl had on the automotive industry generally and GM Divisions (including Holden) specifically.³⁷

While Sparke, Armi, Lamm and Hollis focus on the aesthetics of automobile design, in his social history of the American car, *Auto Opium* (1994), David Gartman explores the social pressures that influenced the manufacturers who in turn influenced the designers. He argues that automobile design as a profession did not exist until the advent of industrial design in the mid-1920s but he traces the beginnings of what he terms "aesthetic integration" from 1908. In the early years the work of body builders and chassis builders was un-coordinated, they built two distinct units, one for the driver and one for the passenger.³⁸ With the arrival of the Roi des Belges style in 1901 however these two separate units began to be integrated, developing into the torpedo style. Jonathan Wood describes the Roi des Belges style in detail, recording the circumstances of its origin and popularity, in addition to describing English bodybuilding. This is important as the first Australian bodybuilders generally took their ideas from European motorcars.³⁹

A more recent publication, *Power behind the wheel: The evolution of car design and technology* by Walter Boyne (1988), provides an American view of car design. Boyne explores engine design before styling, as he believes the power plant has not only undergone more change but has driven designers to market what he terms: "The power beneath the endless hood", using the simple example of the 1930s Ford or Chevrolet and their 4-cylinder engine to the: "265 thundering horses under an endless hood" on the mid 30s SJ Duesenberg.⁴⁰ Boyne proposes that car design has produced the full gambit of fashion:

A few cars have been works of art, more have been beautiful, and many have been simply functional and, as such, attractive. In the bell-curve fashion, we find on the other side of the aesthetic coin some cars that were pure junk, more that were ugly, and many that were simply functional and, as such, unattractive.⁴¹

Boyne leaves it to the reader to determine where cars sit on his bell-curve of perception of good and bad style. A view is gained from the illustrations used in the styling chapter, where Boyne perceives: “Form follows function follows form”. Boyne also divides his distribution of automotive styling over five epochs, 1895-1915 (Primitive), 1916-1926 (Rational), 1927-1942 (Baroque), 1946-1976 (Escapist) and post 1977 (Relearning).⁴² While some automotive historians see the artist appearing in the 1920s, Boyne suggests the artist appeared by 1912, influencing the appearance of the Italian Züst touring car.⁴³

Automobile designers have long used colour to define shape, highlight curves and provide fashion elements. Regina Blaszczyk (2012) in *The Colour Revolution* explores this area of styling and offers valuable comment on the period of polychrome styling – 1924 to 1928 suggesting this was a high-water moment when:

Punchy colour was the ultimate solution [and] opened Detroit’s eyes to aesthetics as a money-making proposition. By the mid-1930s, colour authority had moved from the periphery to the centre as a marketing value. When industrial colourists spoke, corporations listened.⁴⁴

More recently Sparke has continued to address issues related to automobile design in *An Introduction to Design and Culture 1900 to present* (2013) in which the essence of design is captured, where design has been, where it is now and where it is going. Like Gartmann previously Sparke explores the connection between design and culture. Sparke also laments the lack of a definition in earlier work and corrects this omission.⁴⁵

Twentieth-century texts on the history of industrial design generally ignore the automobile although there are exceptions. John Heskett’s *Industrial Design* (1980) devotes a chapter to automobile design, discussing the conflict between aesthetic and utilitarian particularism, a common thread in these histories.⁴⁶ In *A History of Industrial Design* (1983) Edward Lucie-

Smith discusses the Chrysler Airflow as an example of good design but financial failure and the Fiat Panda as an example of a good design brief that led to a successful product.⁴⁷ This inclusion of the automobile in industrial design history was not followed in Hazel Conway's 1987 *Design History – A student's handbook* or Adrian Forty's influential work *Objects of Desire* (1995).⁴⁸

The *Design Studies Journal* follows this general trend and has published little automobile research with just two recent items appearing, Gijs Mom (2007) discusses user-centred design⁴⁹ and Sally Clark (1999) investigated GM Design as a business risk, concluding any design risks GM faced were underestimated due to the dominant position the company held by 1941. Clark suggests GM cars in the 1930s were not necessarily the most fashionable or innovative compared to cars like the Cord 810 however GMs dominance allowed the company to give GM stylists a free hand, as long as their styling fitted within the corporate strategy.⁵⁰

Australian literature

Australian design history

In Australia there is very little critical engagement with automotive design as a subject of research enquiry. What little has been published is found within the industrial design histories of Tony Fry (1998), Michael Bogle (1998) and Simon Jackson (1998 and 2006).⁵¹ Fry's *Design History Australia* examines Australia's industrial design activity in a series of case studies. He highlights the fact that when written, the subject was a new area of study and that past design history was celebratory and promotional rhetoric. Fry however views Australia as a country of borrowers and fails to recognise local automotive design dismissing the design of the first Holden as: "Only an Australian car at the level of market representation".⁵² In the first published survey of Australian design, *Design in Australia 1880-1970*, Bogle did recognise that automotive design was a part of our design history and included the first Holden, initially in the context of marketing and advertising as these activities were performed in Australia. For Bogle, the work of Australian automotive designers was to modify overseas designs and: "The scope for creativity was modest".⁵³ On the other hand he recognised the importance of Sydney Ure Smith's *The Home* magazine in promoting local design noting in particular its 1929 feature on the

work of three artists employed to devise colour schemes for the Improved A model Ford car.⁵⁴ In his later compilation of primary source material *Designing Australia – Readings in the History of Design*, Bogle included Ford Australia’s Colour Harmony advertisement of 1929 and an excerpt from John Laurent’s 1993 study *Industry Policy and the Australian Motor Industry 1920-1942* to set a political background to the industry in the period between the wars.⁵⁵

The most recent historical work is by Simon Jackson (2006) in the *Journal of Design History*.⁵⁶ In his essay *Sacred Objects*, Jackson questions the myth that Australian identity is based on male, practical no fuss inventors who were largely located in rural Australia. According to this myth:

Australians are rural pioneering people who are inventors and improvisers and can battle against the odds; that Australian design got off to a bad start because the nation lacks a Craft’s tradition and that the only real inventors in Australia are of British origin.⁵⁷ Jackson uses the Ford Coupé Utility, among other inventions, to illustrate examples unique Australian design.

Fry’s claim: “There is no such thing as Australian Design and that there are very few purely Australian conceived and designed products, can be questioned,”⁵⁸ writes Jackson, who suggests Fry’s assertion was made as: “There was no national sensibility, no distinctive look”.⁵⁹

The *Sacred Objects* proposition was first put by Jackson (1998) in a thesis, *The Discipline without a name*, where he provides background on Australia’s industrial design history, including a car case study and sections on Design Awareness 1936-1946 and the Creation of an Australian Industrial Designer.⁶⁰ Jackson criticises Australian journalists and social commentators who continue to equate national industrial design success with a few icons of Australian invention and ignore innovations such as the Presto end soft drink can, Bishop variable-ratio rack and pinion steering system, Cochlear bionic ear implant, Toft cane harvester, dual flush toilets and solar panels. If there is a downside to Australia’s industrial design capability it is, as Jackson suggests, the inability to capitalise on ideas.⁶¹ In *Design Awareness*, Jackson provides a sense of true Australian ingenuity, disproving Fry’s view that industrial design did not really exist in Australia before WWII.⁶² Jackson documents Australian innovation in the area of optics, torpedos, aircraft manufacture and motor vehicles, specifically the coupé utility and Holden all-enclosed coupé

from the period 1935-1942.⁶³ His case study of the Caldwell-Vale 4-wheel drive car questions why this high technology venture was ignored by organisers of world exhibitions where Australians were depicted as: "... makers of stuffed koalas, tins of jam and landscape paintings".⁶⁴ Jackson also discusses the development of the Holden car from planning to manufacture. The commonly held idea of Australian design austerity, that the first Holden was without fuss and that Australians wanted a car that was frugal was, as Jackson points out, off the mark as the FJ Holden, the second model, arrived with glitz and is better known than the 48-215.⁶⁵ Jackson and Bogle are exceptions. Generally, Australian automotive history is the province of automotive specialists whose focus is on the history of motoring and motorised vehicles, the automotive industry and individual companies and makes.⁶⁶

Australian automotive design history

As this survey of Australian automotive literature reveals, little has been published about early Australian automotive design or designers. Yet from the first decade of the 20th century automotive design of some kind was taught at the Working Men's College in Melbourne. Edward Carlton (1912), instructor in the automotive school was of the view that utility came first followed by grace of outline thus suggesting that he had a view of aesthetics in relation to the car.⁶⁷ Historians like Peter Stubbs however argue that early Australian manufacturers were slow to cater for the new motor body market, were conservative and often had no formal training.⁶⁸ While it is in the early body shops that we would expect to find our first designers, no-one has undertaken this research. Similarly, while the first Australian car manufacturers like Tarrant and Thomson are well known, the design of their motorcars has been left unstudied. There are one or two exceptions. Bruce Lindsay's biography of Alan Chamberlain *Chamberlain: Australian Innovator* (2007) reveals the work of Chamberlain as both an engineer and designer.⁶⁹ There are also entries in the *Australian Dictionary of Biography* for several industry figures involved in design, including T J Richards, Harley Tarrant, Howard Lewis, Hubert French and Dan White.⁷⁰ Australian automobile designers were influenced by both European and American designers. Few sketches exist although GM-H stylists from the late 1940s, Ron Fimmel and Alf Payze, have left evidence that Fimmel produced work for The Australian Motor Manual and Payze produced

a series of designs for Holden's 1942 body program, designs that were abandoned as war erupted. (Fig. 1.3 & 1.4)

The role of designers at the automotive parts company Repco is acknowledged by Malcolm Preston (2014) and at the Brabham organisation by Doug Nye (2004). Design engineer Phil Irving, who worked for both organisations, published his autobiography in 1992 that charts his involvement in the Repco racing programme as an engine designer. More recently Harriet Edquist's paper (2016) explores REPCO's racing history.⁷¹ Arthur Bishop's biography, *Driven by Ideas* (2003) details his grandfather's

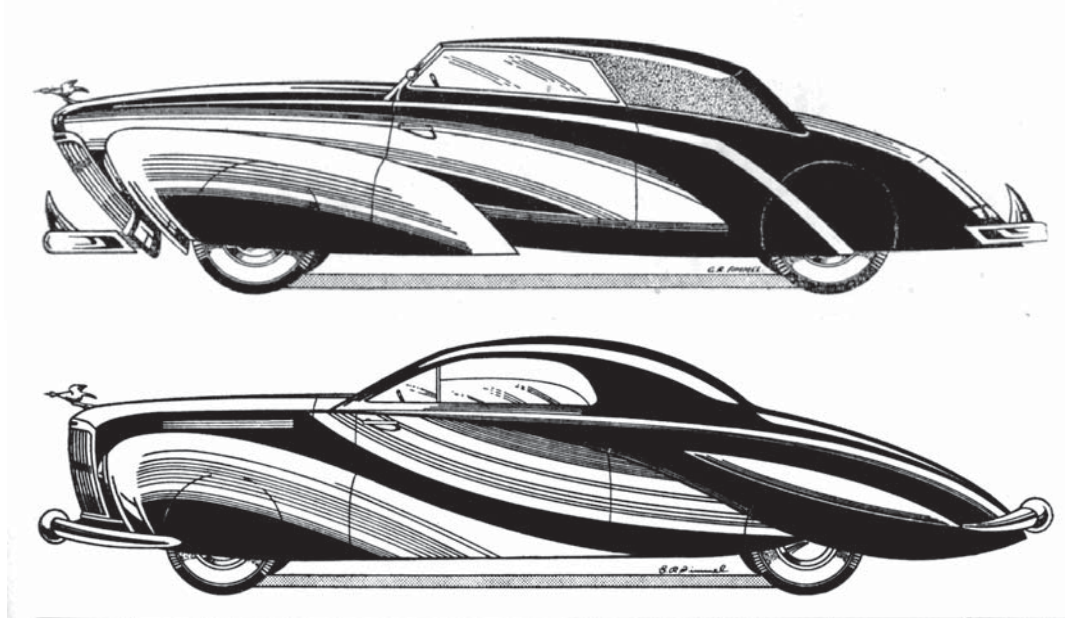


Fig. 1.3 GM-H stylist Ron Fimmel produced these sketches in 1950 depicting classic pre-war European styling.

Motor Manual, June 1951, 199

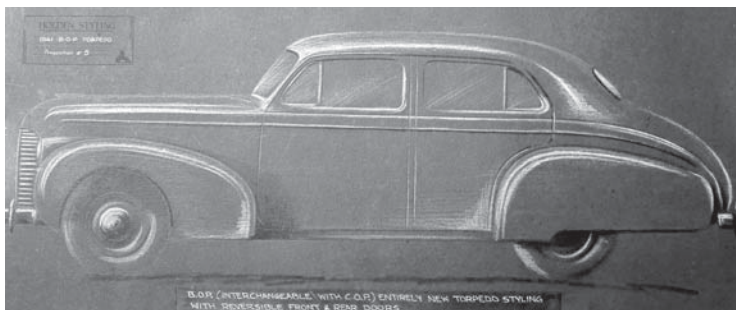


Fig. 1.4 GM-H illustrator Alf Payze produced this sketch as part of the 1941 Holden body development program depicting pre-war American styling. The war forced the cancellation of this program.

N Darwin collection

coach building beginnings, his uncle's editorship with *The Australian Coach builder & Motor Body Builder* as well as his own distinguished career in designing aircraft landing gear for the Beaufort bomber and automobile steering systems.⁷² My own studies of the Monaro and Torana included the designers of both marques including Jack Rawnsley, Leo Pruneau and Phil Zmood.⁷³ Jacques Nasser and Ron Tauranac have fared better than historic figures and with Rawnsley and Pruneau feature in Tony Davis (2011) *Wide Open Road*, where as well as the story of Ford's coupé utility and Holden's all-enclosed coupé, both recognised as Australian designs, full interviews are reproduced.⁷⁴ Company designers also feature in Michelle Cook & Doug Wallace published *Ford Australia- The Cars and the People who built them* (2016), a last look at Ford in Australia prior to the closure of manufacturing facilities at the end of 2016.⁷⁵

The exception to this general story was the 2015 exhibition at the National Gallery of Victoria, *Shifting Gear: Design Innovation and the Australian Car*, curated by Harriet Edquist and David Hurston. The exhibition and catalogue surveyed a hundred years of local automotive design and featured automobiles of Harley Tarrant, Herbert Thomson, Lew Bandt, Ron Tauranac, Phil Irving, Garrie Cooper, Phillip Zmood and others.⁷⁶ It also precipitated the formation of Automotive Historians Australia Inc., and at its first conference in 2016, *Automotive Histories: Driving Futures*, Penny Sparke was the invited keynote speaker. Her paper, *Automotive History: Design versus Styling* proposed that car design could lead the way rather than follow meekly behind other design fields.⁷⁷

Australian motoring

There are many publications on general Australian automotive history, several provided backgrounds on proprietors, entrepreneurs and companies.⁷⁸

Recent writers have relied on Albert Cheney (1965), Nancy Buttfield (1979) and Laurence Hartnett's (1964) autobiographies as source material.⁷⁹

Current research suggests that their recollection of dates in some circumstances is not accurate. The work does, provide an insight into the growing automobile industry in Australia 1897-1930, particularly those parts in which they were actively involved. Hartnett's book, like Cheney's, contains of self-promotion, and in Hartnett's case, according to the Joe

Rich (1996), the stories are not only coloured to reflect Hartnett's role and importance, but facts altered to suit Hartnett's view.⁸⁰ Rich also suggests Hartnett's departure from GM-H was due to his: "Brigand-like penchant for taking independent, unauthorized action, and that this had not gone unremrked".⁸¹

Felix Caldwell, his brother, Norman, and Henry Vale together produced an innovative 4-wheel drive and steer tractor, truck and car. Little evidence has been recorded on Caldwell's engineering effort except for a paper by Jim Longworth (2013)⁸² Longworth in his introduction states: "Engineering inventiveness and business success are not necessarily linked" and that: "There seems to be a misfit between engineering inventiveness and historic fame". Both these observations can be applied to much of Australia's early automotive design.

Restored Cars magazine has published a few articles since 1980 on the development of selected Australian body builders, Max Gregory (1979, 1998 & 2010), providing biographical details of the companies' founders and managers; yet none consider the role of the designer.⁸³

Pedr Davis and his son Tony are two of Australia's foremost published historical authors, having produced a range of general Australian automotive history books detailing auto history including an autobiography that details Davis senior's colourful journey through the industry as an employee, journalist, competitor and author.⁸⁴

Two works by Brian Carroll (1980 & 1987) examine related automobile history. The automotive entries are brief and follow other accounts previously published, and Carroll's automotive story has many generalizations and some glaring errors.⁸⁵ Carroll's second work, *Australian Made* (1987) is a far more valuable source of unpublished automobile history. Examining the Australian companies that manufactured consumer goods, including automotive components after 1937.⁸⁶

Shane Birney (1984 & 1985) produced a photographic essay with specific chapters on Australian Motor Industries, Chrysler Australia, Holden, BMC and Ford Australia then a specific Holden history.⁸⁷ South Australian historian, George Brooks, produced a series of photographic portrait books between 1977 and 1998 for the Sporting Car Club of SA; while small publications they contain detailed early photographs of the period 1898-1931.⁸⁸ Queensland and New South Wales automotive histories by

Richard McDonough, (2016), and David Manson (2016), are the results of many years research documenting the pioneering activities in those states.⁸⁹

On the subject of Australian produced cars three titles have been published, *Gilltraps' Australian Cars from 1879* (1981), *Aussie Cars* (1987), and *South Australian Motor Cars 1881-1942* (1987).⁹⁰ In addition, articles in *Restored Cars* magazine and a chapter in *The Second James Flood Book of Early Motoring* offer brief overviews of attempts to produce complete motor vehicles in Australia pre-1948. A small booklet, *The Story of An Australian Car – The Summit* (1989) has the scarcest information other than detail of a restoration at the National Motoring Museum.⁹¹ All works discuss essentially the same makes and companies, none offer a review of design content and many of the vehicles presented have proved to be rebadged overseas models. (See Appendix I)

The automotive industry

Peter Stubbs (1992) claims the origins of the motor industry in Australia are hazy and ill-documented and there are no statistics of early production or registrations.⁹² Geraldine Lazarus (1981) goes further suggesting that any analysis of the social impact of the motor car in Australia has been handicapped by the existence of ideological silences and analytical gaps.⁹³ Colin Forster (1964) suggests that industrial history in Australia is a neglected field and he quotes Brian Fitzpatrick: “There is no literature of Australian motor manufacturers”.⁹⁴ J W Knott (2000), writing in the *Australian Historical Studies* journal, shows that generally motorisation in Australia has received little attention from historians, meaning academic historians.⁹⁵ To some extent this was satisfied by doctoral research carried out by Peter Swan (1972), Geraldine Lazarus (1981) and Robert Tierney (1991) and master’s thesis by John Laurent (1993) and Tony Watson (1990). Lester Hovenden’s (1981) study of the utilization of the motor vehicle in New South Wales between 1900 and 1937 has a narrow focus and does not discuss design or engineering.⁹⁶ A difficulty with the above-mentioned theses is that all use the same narrow sources, and published authors who have themselves perpetrated errors or overlooked important aspects, particularly design.

Manufacturers and makes

All Australian sources agree that Harley Tarrant and Herbert Thomson were the most successful automobile manufacturers for the early period. Keith Winser, one of Australia's pioneer motoring journalists, discusses these early Australian motor inventors in some detail. Winser possibly used personal knowledge for his colourful stories and uses a good selection of images from the early issues of *Australian Motor Manual Magazine* (1946-1984), which he edited.⁹⁷ Colin Forster (1966) suggests that when the Australian auto industry began it was in the hands of a large number of small Australian firms, but economies associated with standardised production on a large scale meant that the industry would eventually be dominated by a few firms.⁹⁸ Only Pedr Davis (1979), Max Gregory (2003), Bill Tuckey (2003) and Doreen Holmes (1968) devote a moderate coverage to the pioneers' activities.⁹⁹ Stubbs, Swan and Lazarus all agree that the 1917 tariff on complete cars positively affected the growth of the body industry.¹⁰⁰ Donald T Brash's (1966) provides a background to the entry of American mass producers and many of the smaller parts companies that were established in the period prior to the Holden car production in 1948.¹⁰¹

While much has been recorded about Holden's Motor Body Builders (HMBB) there is little published on the other body builders. One of the more detailed accounts on HMBB was written by GM-H production engineer, Frank Daley (1960), although it remains largely unpublished. An abstract was presented as a lecture in 1967 to the Royal Historical Society of Victoria and subsequently published in their journal. Daley also researched the story of T J Richards, Melbourne Motor Body Works and Smith & Waddington.¹⁰² More recent is the work of David Neeley and Tom Clarke (1999), containing a chapter on motor body builders, mainly Sydney companies, but also Martin & King of Melbourne and Cutters of Ballarat.¹⁰³ The Melbourne Motor Body Works history is also examined briefly in the first Flood book.¹⁰⁴ Smith & Waddington's history is mentioned in the Comeng history and T J Richards has an entry in the Australian Dictionary of Biography.¹⁰⁵

The second tier of body builders, and there were many, mostly have no published history. Custom bodies did continue, for example, two firms in Melbourne, Flood and Martin & King, survived through the 1960s and Waddington's reorganised firm was absorbed into Comeng.¹⁰⁶ Two works on the industries' demise by Ian Porter (2016) and Royce Kurmelov (2016) provide background.¹⁰⁷

GM-H and Ford

Five detailed Holden company histories have been published, Terry Bebbington (2009) records the Holden product, John Wright (1998) the company history and my own works, (1983) and (2002) both company history and product, and Will and Tony Hagon (2016) re-examine the company history, the vehicles with some later detail on design and Holden's concept cars. However, none mention the early designers.¹⁰⁸

Many Holden designers from the period after 1945 have been mentioned by Don Loffler, (1998 & 2002) and John Wright (2008).¹⁰⁹ Both authors' works focus on the development of the Holden car released in 1948. David Hayward has also part published his research on the 48-215 development history.¹¹⁰

A Lewis Bandt interview was published in *Restored Cars* in three parts; Bill Tuckey and Geoff Easdown (1987) discuss the ute design.¹¹¹ Bandt also discusses his utility design in the *Institution of Automotive and Aeronautical Engineers Journal*.¹¹² An early Ford Australia history by Donald Hogg (1975) provides Ford Australia's entry to Australia and details the period 1924-1932.¹¹³

Recently, Michelle Cook & Doug Wallace published a Ford history (2016), a last look at Ford in Australia prior to the closure of manufacturing facilities at the end of 2016.¹¹⁴ The Australian coupé utility is the subject of Larry O'Toole's work (2000) and contains detail of Ford's development of the concept and more recently Trevor Polsen (2016) has written a three-part series on Ford Coupé utilities in *Restored Cars* magazine.¹¹⁵

While publications on British Motor Corporation and Chrysler in Australia have been produced there is nothing about the designers of the cars produced in the period to 1920.¹¹⁶

War

The activity of munitions production during the period of the World War One (WWI), until very recently, had been ignored. Since 2012 three studies have been published. Rod Dux (2012), Russell McGurk (2013) and David Finlayson & Mike Cecil (2015).¹¹⁷ Both Ford and Holden produced a record of their World War Two activities, Ford in a general text celebrating their first 25 years in Australia, *Strong Grows the Future* (1950) and GM-H in

a specific *War Record* that details several advancements in production techniques.¹¹⁸ Two publications by Mike Cecil, (1992 and 1993) detail the Australian development of armoured cars, scout cars and carriers in the period 1936-1945.¹¹⁹

Defining automobile design

The definition of automotive design is not fixed and has changed over time.¹²⁰ In 1983 Edward Lucie-Smith argued that the paradox of automotive design was that the brief to create such a thing is necessarily unspecific. He suggested a non-domestic product, like the automobile, reflected an interplay between function and symbolic design.¹²¹ Adrian Forty (1995) also took the brief into consideration when he offered two meanings of design; what an object looks like (the visual) and what the instructions to make the object are (the instruction). He argued that the two meanings are inseparable, suggesting that the way things look are a result of the conditions of the manufacture.¹²² In a recent paper Sparke (2016) set out to address the changing nature of design in the 20th century. For the early period covered by this thesis she used the case studies of Ford and GM and argued that the model T Ford was not about aesthetics because to own a car was status symbol enough. GM under Harley Earl countered Ford with the annual model change, transforming the automobile from an engineered object to a stylish consumer artefact and an object of desire. Technology and engineering were overshadowed by design.¹²³

For the purpose of identifying and discussing Australia's early automotive design and designers, I have used Forty's definition as it is the most applicable to the time period I am covering in this thesis.

The Architectural Association of London's *Structural Decision Tree* (Fig. 1.5) can be used to illustrate how the elements of design and engineering can be, in the case of automobile design, combined.¹²⁴ A revised *Decision Tree* is offered (Fig. 1.6) to show how the visual and instruction elements of design can be included, as the automobile is a structure.

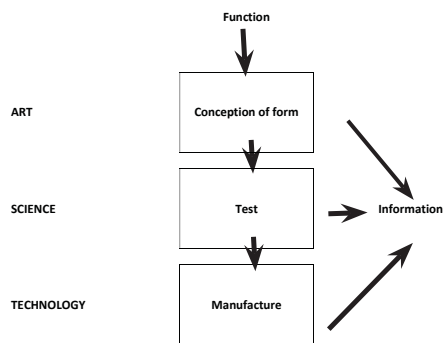


Fig. 1.5 Structural Decision Tree

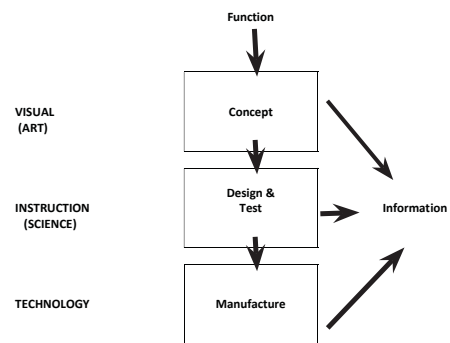


Fig. 1.6 Automotive Design Decision Tree

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Chapter 2: The development of the first motorised vehicles 1895 - 1916

European context

The earliest experiments in individualised powered transport took place in France. In 1600, Simon Stevin proposed a two-masted sail carriage. Forty-five years later Parisian Gui Patin suggested spring powered coaches. However, it was not until 1690 that Denis Papin, who had invented the pressure cooker, came up with his theoretical atmospheric machine, a piston acting on a ratchet that propelled his vehicle. Matthew Boulton showed it was all possible when, in 1765, he displayed his model steam engine to James Watt and Benjamin Franklin. It was, nevertheless, Frenchman, Nicholas Joseph Cugnot in 1769 who first harnessed steam to drive a gun tractor.¹ While this development heralded a slew of steam coaches, a practical motorcar was still a way off.

By 1860 technological advances, including gear cutting, electrics, accurate cylinder boring, and improved lubricants, allowed the development of the first practical motorcars. This occurred in Austria where by 1870 Siegfried Marcus completed a 4-wheeled vehicle powered by a 4-cycle combustion engine, an event now considered to be the first true automobile. Ten years later Karl Benz and Gottlieb Daimler simultaneously developed automobiles. Daimler fitted his ½hp single cylinder Otto cycle engine to a two wheel bone shaker and then constructed a four wheel horseless carriage early the next year. Karl Benz had built a 2-cycle engine in 1879, but it was not till 1885 that he completed a 3-wheeled vehicle (Benz patent motorwagon). (Fig. 2.1) Benz until recently was given the credit for producing the world's first true automobile but now historians

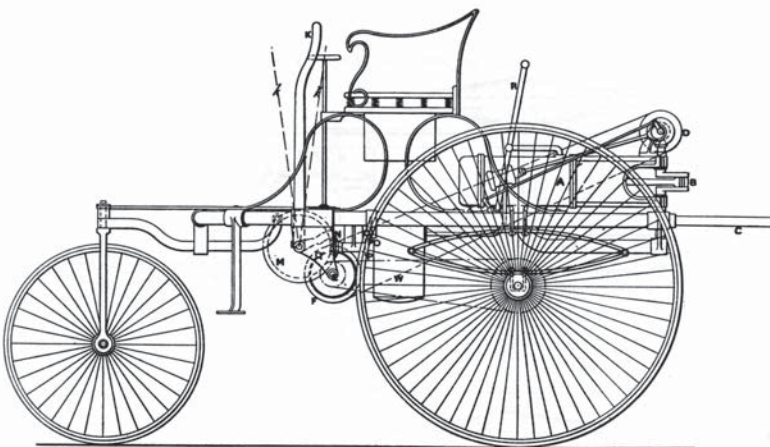


Fig. 2.1
Benz Motorwagon of 1879
Motor Vehicles and Motors, 75

recognise that Nazi Germany expunged Siegfried Marcus, a Jew who designed a prototype car, from the record.² A third engineer, Jean Lenoir, had invented a gas engine in 1858 and following a patent in January 1860 built a 3-wheeled dog-cart. Henry Ford later used Lenoir's patent to defeat the George Selden master patent on automobiles.³ America trailed behind Europe, yet by 1896 many tinkerers and inventors had automobiles running.⁴ Frank and Charles Duryea basically copied Benz and Daimler's efforts and then patented their 1893 automobile in 1895. Henry Ford ran his first car in 1896 and Ransom Olds had a steam car running the same year.⁵ Both these men would produce more vehicles in a day in 1903 than Australia would produce in the 50 years between 1895 and 1945.⁶

The design of the first automobiles took their cues from the existing coach industry, particularly when it came to providing a place for the driver and passenger. In turn, the coach-builders supplied their existing fare, giving rise to the term, "horseless-carriage". It took seven years before the automobile took on an appearance we now accept as a motorcar. Around 1892 Emile Levassor and René Panhard constructed a body that suited their new mechanical layout; the engine and radiator were moved from the rear to the front of the chassis, and the rear axle was connected using an exposed transmission, short prop-shaft and chains. The "Systeme Levassor", as it became known, was quickly adopted by Benz. (Fig. 2.2 & 2.3)

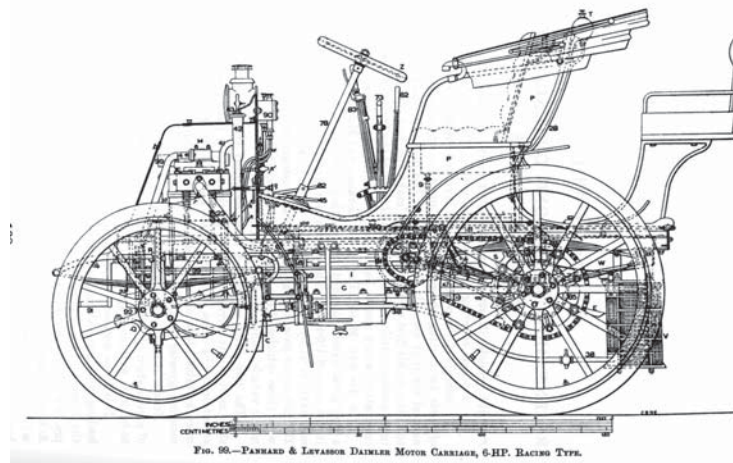
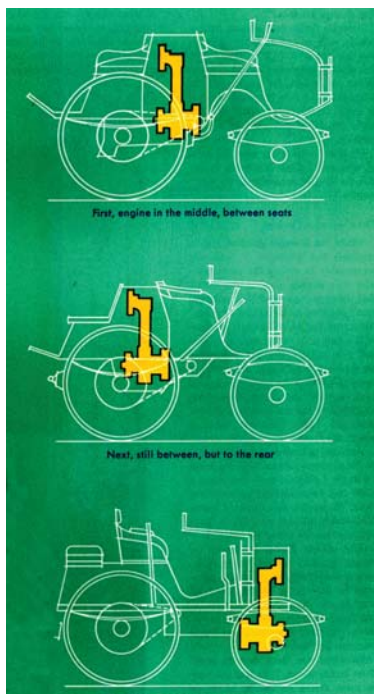


Fig. 2.2 Above. Panhard & Levassor Daimler Motor Carriage 6-HP of 1898

Motor Vehicles and Motors, 75

Fig. 2.3 Left. Evolution of engine location in Panhard-Levassor cars 1890-1897.

GM World July 1962, 9

The Panhard cars continued to lead design development and by 1897 their cars had steering wheels and enclosed transmissions.⁷ The first vertical radiator was developed by Wilhelm Maybach and used on the 1901 35hp Mercedes.⁸ It was in this context that hopeful Australian manufacturers, on the other side of the world, designed and produced the country's first automobiles.

Development in Australia

Were Australia's first automobile builders the first designers? I will argue yes, with a qualification. Adding an engine, particularly someone else's engine, to a buggy, is not the work of a designer. There needs to be evidence of design activity, a sketch and or drawing of intent. A patent application provides proof of design intent. In researching early designers in the period 1895-1898 I have discovered that patent drawings are the only reliable primary source. This chapter identifies Australia's first automobile designers using patent applications.

Automobiles in Australia, in any form, lagged behind European development by ten years. Technically, the capacity to build an automobile existed in 1890 and shortly after this several pioneer inventors were on the cusp of turning an idea into reality. This chapter explores these first attempts at producing an Australian car. The first Australian-made automobiles were not what we would now understand as motorcars; rather they were motorised bicycles, dog-carts and vans. The Melbourne public was given a glimpse of the future Australian motoring industry in February 1897 at the Exhibition Buildings when the Cycle Show was opened by the Governor of Victoria, Lord Brassey. Among the hundreds of bicycles and cyclists impedimenta were several motor powered vehicles. One, described by journalists as a double seated four-wheeled dog-cart, was displayed by the Australian Horseless Carriage Syndicate.

The vehicle was claimed as Australia's first locally made motor car; as it transpired, it was not the first built but perhaps the first to go on public show. The vehicle, in the words of a Melbourne reporter, was hurriedly put together so as to be on time for the show. It was:

Somewhat heavy in appearance, weighing 8cwt, some little smoke escapes (through a leak it is said), and the working of the motor is by no means noiseless, there is more than a suspicion of a smell of oil and considerable vibration.⁹

The vehicle's builder, Walter Ridge, a Fitzroy engineer, used English patents of Gibbons, Roots, Daimler and the Australian patent of Fitzroy dentist, Henry Austin, and his own steering invention. The dog-cart mechanical components were made by Fitzroy engineering firm, J Grayson & Sons and the body constructed in 1896 by Jackson's Carriage Works, Brunswick Street, Fitzroy. The coachbuilder apprentice who worked on the vehicle was Alex Smith who in 1923 recalled: "It had a bracket fronted body, dog cart style, with an elliptic spring across the front. The power was kerosene engine with a chain drive off a sprocket attached to the spokes of the wheels".¹⁰ (Fig. 2.4)

The car designer, Henry Austin, had gained a patent (no. 3385) for *Improvement connected with motors and mechanically propelled vehicles* in 1896. (Fig. 2.5) Austin, a surgeon dentist worked in David Street, Fitzroy and was convinced he could design a light car and engine. Following a study of European designs he spent four months drawing up his vehicle before applying for patents. The first attempt at running the 2-stroke 2-cylinder engine resulted in severe vibrations so the Horseless Carriage Syndicate had Grayson install a smaller engine that Grayson was selling so the car could be ready for the cycle show.¹¹

The Horseless Carriage Syndicate, formed by William Barham, was announced in November 1896 by way of a published letter to the South Melbourne Council seeking permission to run cars on the parade (Beaconsfield Parade).¹² An official announcement of a Pioneer car being constructed in Melbourne appeared in Australian papers in December 1896.¹³ The horizontal oil (kerosene) engined vehicle first ran in Fitzroy's streets in early February 1897 and again when it was driven to the cycle show on 26 February 1897. A good deal of publicity was gained when the syndicate secretary, Barham, arranged for Lord Brassey to view and ride in the vehicle outside the exhibition.¹⁴ Lord Brassey: "...seemed very agitated during the performance and was quite relieved when the ordeal was ended".¹⁵ Barham announced that a second vehicle was under construction and orders for further cars were held by the factory.¹⁶

The *Australian Cyclist* described the Syndicate's car as stylist beautifully painted and trimmed:

The motive power, derived from a horizontal oil engine using ordinary Kerosene, takes up a small space in the rear, and acts upon friction gearing (with chain and sprocket wheel resembling

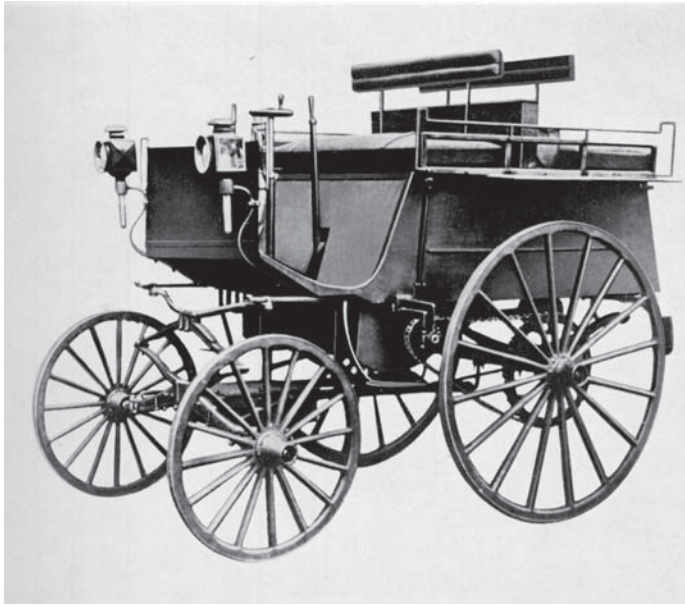


Fig. 2.4 Australian Horseless Carriage Syndicate vehicle first shown at the 1897 cycle show in Melbourne.

The Australian Cyclist, Tourist and Traveller 1899 - SLV

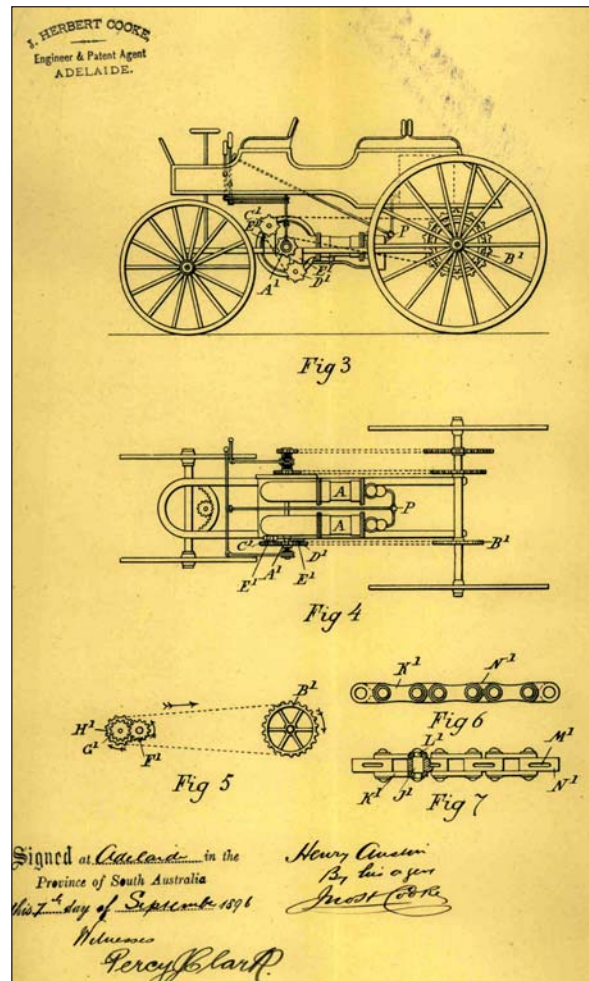
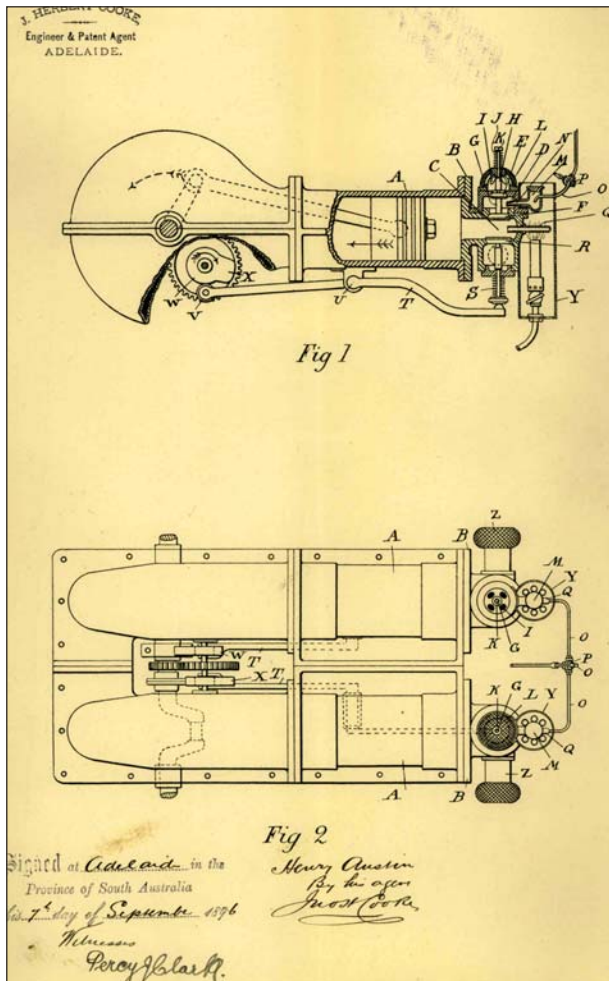


Fig. 2.5 Henry Austin's patent (no 3385) showing general layout of the Horseless Carriage (1896).
National Archives of Australia - Australian Patent Office

the bicycle) direct on the rear wheels. The fire carriage is a smart piece of skill, possessing the desired turning power for busy street traffic or narrow roadways. The controlling power levers, simple enough for anyone to learn quickly, are all handy to the driver.¹⁷

Austin went back to redesigning his engine but discovered Ridge had ordered more engines from Grayson. Unhappy with this arrangement and being heartily sick of the manner in which he had been treated, Austin decided to adopt a let-it-slide policy. In the end the Syndicate fell apart, debts mounted and liquidation was sought. It was reported that both the car and money vanished into thin air.¹⁸ Austin continued to dabble in developing his engine and a light car, but nothing further came of his project. It is unknown if the stress of the Syndicate shenanigans had an impact on Austin's health, as on 31 May 1904 he died very suddenly.¹⁹

There were two other displays at the cycle show of auto-cars. The Australian Cycle & Motor Company, agents for Humber bicycles, had imported a Humber-Beeston trike. These units were available from the Beeston Motor Co of England with a 1¼hp De Dion-Bouton engine and Henry Sutton purchased one in 1897.²⁰ Presumably, this was the unit he saw at the show and ordered or purchased. The other firm, the Gladiator Company of France, employed L Ullmo of Sydney as an agent. At the time of the cycle show several French cyclists were in Australia promoting the Gladiator brand. They brought with them a number of pacing bikes and trikes that were put on show and at least one was powered with a small engine.²¹ The *Australasian* journalist recalls one of these trikes was owned by W E Canning of the Austral Cycle Agency, a second, an Ariel, with a De Dion-Bouton engine, was purchased by tea merchants, Griffith Brothers, and ridden by employee, Horace Harrison.²² However, according to the *Australian Motorist* of September 1909, Harrison's Ariel (then part of the Ariel Cycling Team) landed in March 1898. In June the Ariel Cycling Team arrived in Brisbane and Harold Eaton-Knight demonstrated it at the Gabba oval.²³

C H Perrin, then Tarrant's chief mechanic, said of Harrison's trike that: "It seemed to be the firm's best client as the machine he used was a glutton for steel pinions".²⁴ In mid-1898 it was reported that several Gladiator motor tricycles were landed by the English and American Cycle Agency in Sydney.²⁵ One was ridden by the famous Mademoiselle Serpolette, another by the store's department manager.²⁶ There is a report that the Serpolette's

Gladiator, and perhaps the others, were landed in Perth on 21 April 1898 for the start of the Tour. Then they were shipped via Adelaide to Sydney.²⁷

The appearance of the Ridge/Austin automobile in 1897 was obviously rushed. Had Ridge and Austin gained knowledge of Herbert Thomson, John Pender, Marcel Certain, Harley Tarrant or Henry Sutton? All were actively working on aspects of motorised vehicles in Melbourne at the time.²⁸ There is also a report that a W Grayson built a horseless carriage after 1897, although it is unclear if this was the same family as Grayson & Sons and thus was part of the Ridge/Austin enterprise.²⁹ William Grayson was the son of John Grayson, and their firm is said to have attempted another car in 1906. *The Australian Motorist* of May 1933 on viewing the 1906 car at a Veteran Car Rally, suggested it was possibly put together from imported English components from the era.³⁰ This was the first veteran car rally to be held in Australia.

Herbert Thomson, an Armadale engineer, ran an early version of his double-phaeton in May 1896, Harley Tarrant had his engine patented in 1897, and Henry Sutton is recorded as having taken up the idea of a motor car in 1895 following a visit to Europe. As well as building a powered pacing bike around 1898, Sutton worked on an engine and a carburettor that he patented in 1897. John Pender, a nail manufacturer in Fitzroy, saw a Hertel automobile in America in 1896 and ordered one, however, he is said to have been unhappy with the transmission and returned home to design a better one, which he patented.³¹ (Fig. 2.6) Pender's tale has been



Fig. 2.6 Above. John Pender's (driver) car bears a very strong resemblance to the Oakman built car sold to Hertel.



Fig 2.7 Above. The Oakman Motor Company vehicle.

Oakman Motor Co. advertisement

repeated many times. Matthew Churchward, senior curator at Museums Victoria advised the transmission fitted to the Hertel car has no local casting marks and suggests Pender had no input. The situation is further complicated as Pender was a director of the Australian Auto-Car Company who were assigned an invention dealing with an engine and transmission system. The question is, was Pender the designer of the Australian Auto - Car company's transmission and has this been confused with the Hertel car transmission?

Frank Cato later recalled Pender's efforts were costly and that he had frequently asked him advice on getting the machine to operate properly.³² Pender's Hertel arrived in Melbourne on 8 November 1897, reputedly the city's first imported car. Pender's car was later claimed to have been locally designed. The vehicle, however, looks remarkably similar to the car designed by the Oakman Motor Vehicle Company of Greenfield, America.³³ (Fig. 2.7)

Pender donated the Hertel to the Melbourne Museum in 1914 omitting to record the fact that Oakman contracted Hertel to build the vehicle. Pender was also a director of the Australian Auto-Car Company: it is possible that he worked with the company's inventor, Marcel Certain, a South Melbourne civil engineer who with Ernest Chatelain formulated a patent (no. 14426) on 29 July 1897 for *An improved motor for propelling horseless carriages and similar*.³⁴ (Fig. 2.8 & 2.9) In early 1898 Certain was recorded as being within days of having his horseless carriage, a modified Abbott buggy, running. Nothing further was heard of Certain or the Australian Auto-Car Company.³⁵

In Dimboola, country Victoria, blacksmith and stump jump plough maker, Richard Tucker together with William Radford and Robert Singleton, drew up a specification for an improved horseless vehicle, subsequently making a patent application on 16 June 1897 (no. 14288). The examiner, Mr Watson, was not impressed writing: "A tricycle? Patent title misleading. The invention is possibly novel, the specification is partly prepared and hardly sufficient".³⁶ The application was subsequently abandoned on 11 May 1898. Perhaps Mr Watson examined the Anglo French Motor Carriage patent application submitted six months earlier. (Fig. 2.10) This company, based in Birmingham, had acquired the Émile Roger & Cie (Paris) French Benz patent. Anglo-French then patented the Roger-Benz vehicle in Commonwealth countries.³⁷

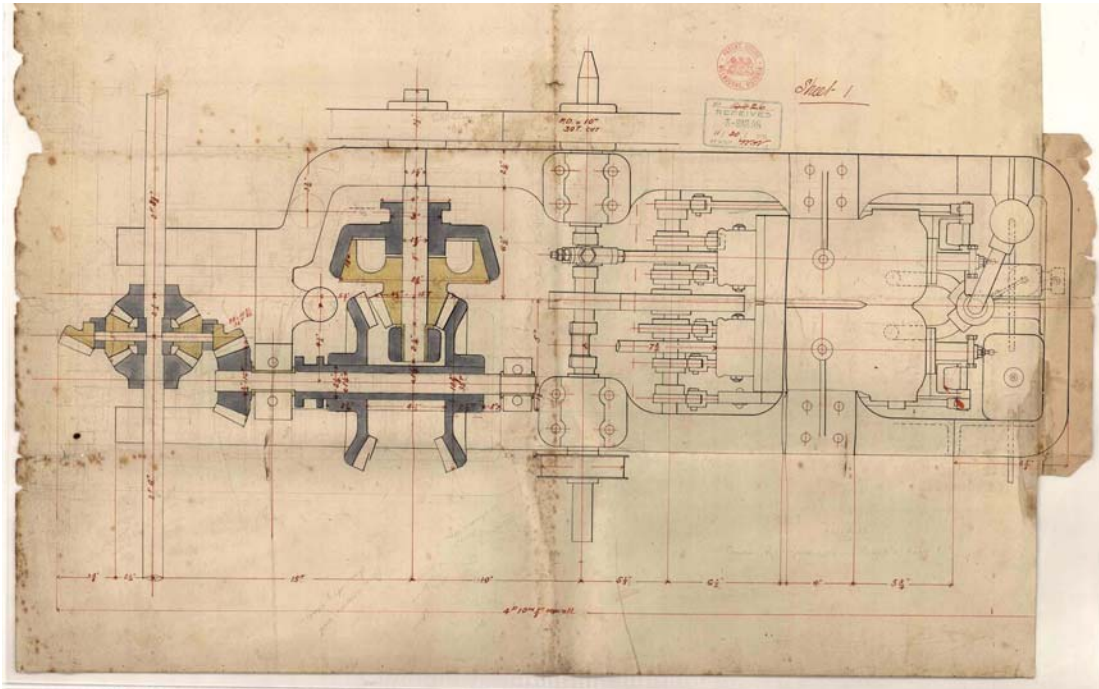


Fig. 2.8 Above. Marcel Certain's patent drawing 1897 for an engine and transmission system.

NAA - Australian Patent Office

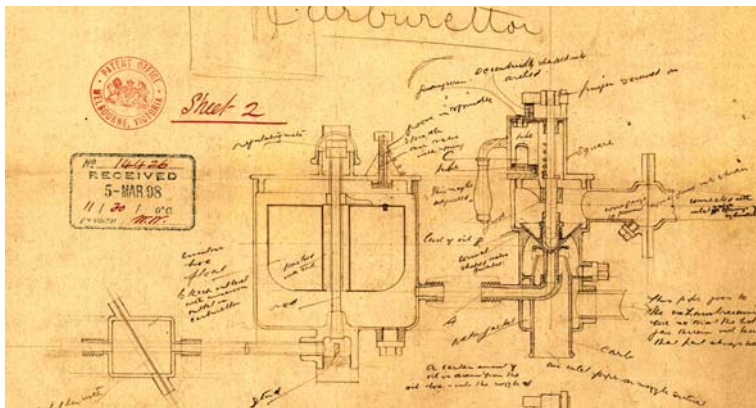


Fig. 2.9 Left. Marcel Certain's patent drawing for a reasonably advanced carburettor (for 1897).

NAA - Australian Patent Office

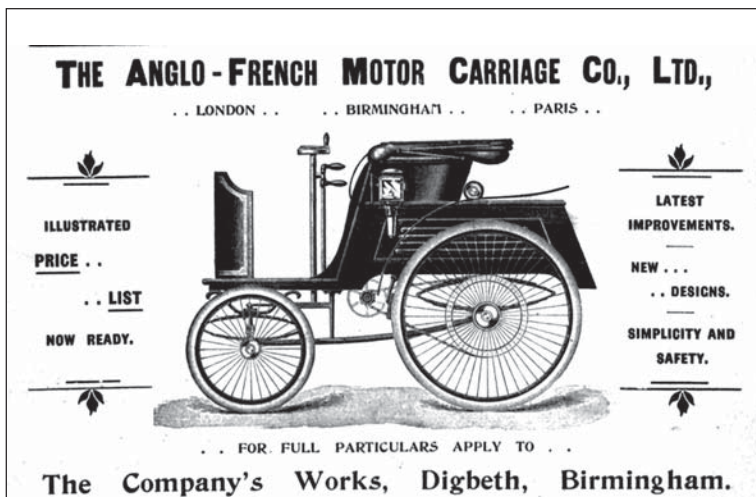


Fig. 2.10 The Anglo-French Motor Carriage was established by Émile Roger of Paris, in partnership with Benz to market Benz vehicles outside Germany.

Anglo-French advertisement

At the same time, in 1897, that Ridge and Austin were building their vehicle, Herbert Thomson and Harley Tarrant were well advanced. Thomson's first steam powered vehicle ran in May 1896 but it was two years before he was sufficiently happy to display it. Harley Tarrant commenced his own engine design in the early 1890s and by 1898 had a small auto engineering business operating. Tarrant, then holding a Benz agency, is claimed to have imported a 4½hp Benz in 1898, selling it to A D Terry who subsequently raced against Thomson's steamer in 1899 and lost. The date claim is disputed by W J Proctor, the Dunlop manager, who wrote in 1917:

I might say that there seems to be a bone of contention as to who imported the first motor car into Victoria. A man named Craven imported a 3½hp De Dion-Bouton in December 1899. Our car of similar type landed here in January 1900. Those two cars can be definitely accounted for. A Mr Terry claims that he brought a Benz car several months before Mr Craven, but this I cannot verify.³⁸

Thus several months would indicate the Tarrant Benz was landed in the last half of 1899, however, Edward Holmes said the Terry car was still in a box in March 1900. Also to note here is that our car Proctor refers to was actually an Ariel Tricycle with a De Dion-Bouton engine.

The only significant early auto development in New South Wales was performed by electrician Charles Highland. Highland's son, also Charles, is said to have built a motorised tricycle in 1894 with a Daimler engine. Although this claim is unsupported, in 1895 the Highlands did import a 1.75hp De Dion- Bouton engine for this purpose. Highland gave the engine to George Wood of G W & G Wood who disassembled it and by reverse engineering came up with their own engine. The re-assembled De Dion-Bouton engine was then fitted to a copy of a Gladiator Quadricycle by the Woods, and Highland operated this in 1897. In 1898 G W & G Wood produced what could be claimed to be Australia's first motor cycle when they fitted the engine between the wheels rather than behind the rear wheel.³⁹ No patents or drawings by Highland or Wood have been found suggesting neither can be credited as an automobile designer.

Thus, by 1897 it can be seen that automobile design was on the edge of being a reality, with six Victorians, Thomson (1896), Austin (1896), Certain (1897), Tarrant (1897), Sutton (1897) and Pender (1899) preparing patent

applications. Three of these applications would result in the manufacture of Australia's first viable motor cars, those of Thomson, Tarrant and Sutton. Although the *Coachbuilder and Saddler* was not confident the motor industry would emerge, reporting in July 1897:

Those motor cars are very slow in putting in an appearance in Australia. It is two years since it began to boom. The enthusiastic builders who were to have their vehicles running in the streets of Melbourne and Sydney quite twelve months ago, have apparently abandoned former hopes and turned their attention to other things.⁴⁰

For viable automobiles to be built, designers required suitable machinery, materials, technology and education. The next section explores the development of these factors up until 1895.

The development of automotive capability to 1895

This section reviews the development and state of industrial capability in 1895 Australia, the dawn of the automobile. Several key events are highlighted, since without these the construction of motor cars, trucks and their component parts would not have been possible. While advanced technical education was not a prerequisite for invention, it was required to develop automobile design, thus the capability of early designers to put their designs into practice, as going saleable automobiles, required a technical and engineering education.

As was the case in Europe and the United States, the development of an automobile industry in Australia could not have commenced without a great deal of technological, engineering and educational investment. The ability for designers and engineers to turn their ideas into practical, working machines required a foundation in mechanical, chemical and electrical engineering. As engineering historian, C Weickhardt, wrote in 1955: "Without the pioneer engineers, their work, the resources of the State (Victoria) would not have been developed to the degree they have".⁴¹

Although the colony of New South Wales had a developed industrial base prior to the discovery of gold in 1851, it was the influx of immigrants and capital into New South Wales and Victoria that created the right conditions for technological transformation. Within ten years Australia's

manufacturing sector exploded and the majority of this industry was satisfying gold miners and most of these were in Victoria. Following the gold rush and the exhaustion of alluvial gold, mining companies, in their quest for deeper shafts and tunnels, required steam engines, water tanks, windlass equipment, trolleys, crushers, furnaces and pumps. From this demand sprang many specialist engineering companies. In Ballarat in 1855 for example, there were 13 steam engines powering pumps to clear water from deep lead mines and in less than three years the number had grown to 135.⁴²

This context gave rise to some significant technological innovations and some inventors achieved remarkable success. Frederick Wolseley perfected a mechanical shearing head in the 1870s but could not find the capital to fund its manufacture. Returning to his native England in 1889, Wolseley set up in Birmingham. Friend and fellow engineer, Herbert Austin, joined Wolseley's endeavour, making improvements to the overhead gear and becoming the work's manager. As a young man in the 1880s and early 1890s Austin (later Lord Austin) had worked as a fitter for Austral Otis Co and then for Goldsbrough, Mort & Co in Melbourne. In 1894 he built his first car in England, naming it a Wolseley. Austin then went on to form the Austin Motor Co in 1905.⁴³

Hugh McKay, on the other hand, was born in rural Victoria and developed his famous stripper-harvester in 1885 securing capital to form a manufacturing company, later called the Sunshine Harvester Company. McKay's first harvesters were produced by Melbourne plough makers, McCalman Garde & Co.⁴⁴ Anthony Michell studied civil and mining engineering at the University of Melbourne and in 1905 was granted a patent for the Michell Thrust-Bearing that subsequently was used in auto transmissions and ship prop shafts. Michell became an expert on oil lubrication and in 1920 formed the internationally well-known Crankless Engine Company.⁴⁵

Melbourne has a rich history of engineering innovation, and engineering companies ultimately paved the way for automobile design and manufacture. Throughout the city and inner suburbs, engineering companies were established to provide the infrastructure for industrialisation on a large scale. For example, Langlands produced cast iron, initially for shipbuilding but then for mining, including the first rotating stamping mill for crushing ore. The rotating stamp prolonged the

life of the stamp and its principal was copied all over the world. Robinson, Martin & Smith produced steam engines for various applications from the 1850s. When the Hobson's Bay Railway project commenced in 1853, the firm built a steam tender to aid construction. Johnson & Sons built gold dredges, steam boats and hopper barges. A neighbouring company, Wright & Edwards in Little Bourke street, built steam engines, wool washing plant, presses, railway trucks and mining plant. Wright & Edwards became the Atlas Iron Works and in 1899 were taken over by George W Kelly of Kelly & Lewis, known for pumps, compressors, petrol engines and condensing plant. Other concerns like Robison Bros. built ships and pioneered centrifugal pump manufacture; in 1880 they began to build ship refrigeration units for transporting lamb to the United Kingdom.⁴⁶

While the steam engine provided the essential power to run machines they were inefficient, consumed large quantities of lumber and were generally cumbersome. Portable steam traction engines made their entry into Australia from 1859.⁴⁹ Until electricity arrived in the colony, power was transmitted by belts and pulleys. While arc lamps provided light to the folk of Melbourne in 1863 this form of lighting was not practical; electricity was the answer. The formation of the Australian Electric Co Ltd by R E Joseph in 1881 and the New Australian Electricity Company in 1882 by James Service and F Pirani heralded the delivery of electric power in Melbourne.⁵⁰

The advent of the practical oil engine by Otto in 1876 also boosted industrial development. These light power sources were imported into Victoria from mid-1889. The Gas engine, fuelled by coal gas, arrived around 1880 and by 1884 G Scott & Sons of Melbourne were producing their own Gas engine.⁵¹ It is generally considered A H McDonald & Co of Glenferrie built the first commercially successful Australian stationary oil engine in 1903, followed by Ronaldson & Tippett of Ballarat who produced the Austral in June 1904.⁵² Other commercial Australian oil engine manufacturers were P Rayson (1904), Diamond Share & Engineering Co (1905), Humble & Sons (1905), T Marriott & Sons (1906), Jelbart (1909) and Clutterbuck brothers (1916). Clutterbuck engines, built in Gawler South Australia, were the only ones outside Victoria. There were also a few small engine producers who found more money in automobiles, namely Harley Tarrant and George Wood.⁵³

Innovation requires an educated workforce and technical education was prominent in the Victorian Government schools programme. To meet the demand for industrial expansion, particularly mining, Schools of Mines were established in mining centres Ballarat (1870), Bendigo (1873) and a number of smaller towns like Daylesford and Castlemaine. Unconnected to the University of Melbourne (established in 1854) they principally taught subjects relating to mineral extraction and production. The University responded by introducing a certificate of Engineering in 1861 and by 1887 established a Faculty of Engineering, the oldest in Australia. Concurrent was the formation of the Working Men's College (now RMIT University) in 1887, which took over some of the instruction in applied technology that had been carried out by the curators at the Technological Museum, housed with the Public Library in a building opposite the College in La Trobe Street.⁵⁴

By 1889 day classes were being offered for a diploma in mechanical and electrical engineering. By 1900 the Working Men's College (WMC) was the recognised school for educating boys who sought an engineering vocation. In 1892 the WMC commenced classes in Coachbuilding and Carriage Drafting under part time instructor, Edward Carlton.⁵⁵ In early 1903 F A Campbell introduced a private course for motor mechanics.⁵⁶ In Geelong the Gordon Memorial Technical College commenced classes in 1888 and a two-storey engineering and chemistry wing was erected in 1890.⁵⁷ By 1890 there were 16 technical institutions in Victoria, mainly Schools of Mines, but also the Horsham and Melbourne Working Men's Colleges.⁵⁸

The first Australian automobiles after 1898

In 1898 Johann Ziegler of Allansford (near Warrnambool), Victoria, built two steam cars using local material. Ziegler was a skilled German machinist who arrived in South Australian in 1884, aged 32. One of his cars was sold to defray the costs of the second.⁵⁹ A Ziegler engine is owned by Scienceworks Museum. (Fig. 2.11)

At Ballarat, Arthur Leckie and Mortimer Franklin of the Davis Franklin Bicycle Company both produced Quads or Quadricycle cars in 1899 -1900. Franklin's car was simply two bikes joined together with the passenger sitting between the front wheels, the engine between the rear wheels. (Fig. 2.12) The Franklin Quad was almost a copy of the De Dion-Bouton quad

cycle. (Fig. 2.13) Leckie's car is detailed in Appendix I. A proposed car by William Burton in 1898 relied on an engine patented by Marcel Certain, a civil engineer. Neither the car or engine materialised.⁶⁰

The only South Australian vehicle pre-1900, that can be loosely termed a motorcar, was David Shearer's steam wagon. Constructed by farm machinery manufacturer in Mannum, South Australia the Shearer wagon was simply a large coach style vehicle with a big steam engine and 350lb boiler taking up most of the room. (Fig. 2.14) The Shearer was built for private use around 1895 and was a regular sight in Mannum between 1897 and 1898 holding up to nine passengers. It could reach speeds of 15mph and was said to have the world's first differential fitted.⁶¹

It would be a further three years before another South Australian, Vivian Lewis, would dabble in a local motorcar. Lewis did, however, build a motorised tandem bike in 1898. Prior to 1900 only two imported cars can be identified in South Australia, both Peugeots.⁶²

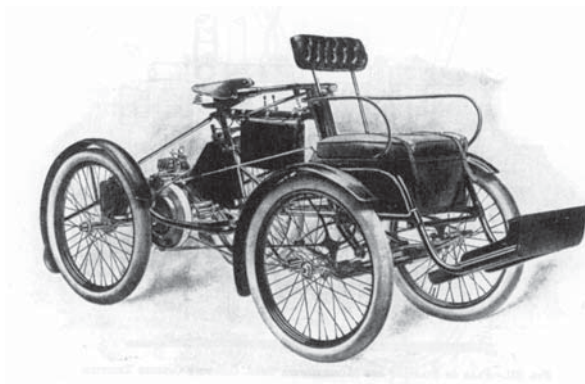


Fig. 2.11.Above. Zeigler engine
W Bryce



Fig. 2.12. Left. Davis Franklin Cycle car, similar layout to the De Dion-Bouton.

N Darwin collection.

Fig. 2.13. Left. Above. De Dion-Bouton Motor Quadricycle car.

Motor Vehicles and Motors, 300

In terms of early automobiles, New South Wales and Queensland lagged well behind Victoria. Motoring in Sydney made no progress until W J C Elliot, proprietor of the Austral Cycle Agency, saw the potential and left for France and England in 1899. In December he signed a deal with Mr H O Duncan, the De Dion-Bouton foreign representative, for rights to their automobile. A De Dion-Bouton subsequently arrived in Sydney in March 1900 and was sold to Elliot's manager, Alick McNeil. Very quickly McNeil took orders for De Dion-Boutons from Mark Foy, Dr McGill and Dr McCarthy.⁶³ McNeil became Garratts Ltd general manager in 1910 overseeing one of the world's largest Fiat agencies.

Harold Knight-Eaton fitted a small engine to the rear of his cycle as early as 1893 but it failed to run.⁶⁴ Knight-Eaton was the Manager of the Brisbane Austral Cycle Agency. In April 1895 he acquired a Wolfmüller motorcycle and displayed it in the Sydney Austral Cycle Agency, advertising it would be driven away down George Street at 3.00pm on 29 April. A massive crowd turned up to see him do just that.⁶⁵

Frenchman, Mr Bargili imported a 3-wheel Leon Bolee Voiturette in November 1897, in the same year W E Brookman landed a Benz car.⁶⁶

Two other powered vehicles are worth mentioning although neither can be considered an automobile or a motor-cycle. Nevertheless, both play a role in the development of Australian road going horseless vehicles. In June 1859 the brigantine Dazzler disgorged what is considered Australia's first road going vehicle at Port Gregory, West Australia A. It was a steam Bray traction engine and had been ordered by the manager of the Geraldine Mine to run a saw, providing fuel for the mine's boilers.⁶⁷ Many more

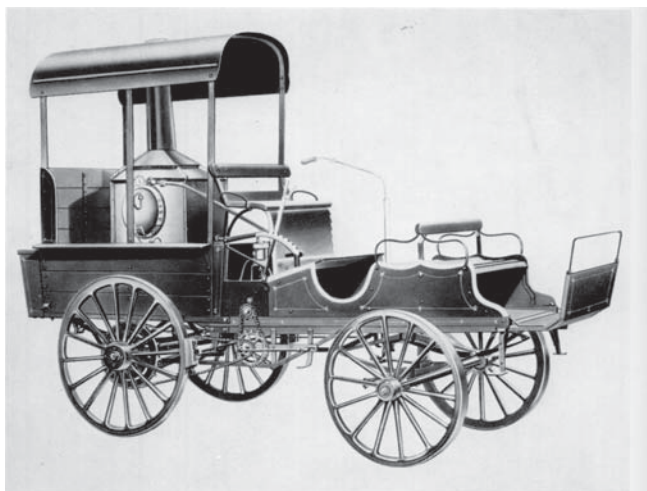


Fig. 2.14. David Shearer's steam vehicle.

Birdwood Museum collection

traction engines followed this first import and they became a common sight on farms from 1880 to 1920. The steam coaches that roamed England never made it to our shores, even if the Sydney papers of 1836 thought they would. Andrew Nash, a former Sydney convict, claimed he had a steam coach on a boat headed for Sydney but it failed to materialise.⁶⁸

A more significant event happened in Ballarat in March 1873. The Phoenix Foundry drove their steam truck out of the factory in Armstrong Street and headed for the Ballarat rail yards. The large steam truck was specifically designed to carry the first Phoenix locomotive, No 83, to the Victorian Railways. (Fig. 2.15) There was no rail link so a steam truck was built with a hydraulic ramp and winch to load the 40-ton loco and move it to the rail head. Phoenix manager, Campbell Laird, also built a steam car at the foundry in mid-1906 with the view of putting it into production. The foundry closed soon after.⁶⁹

All this activity was dispersed across a large country and tiny population and as Australia moved into the 20th century *The Scientific Australian* reminded us that we lagged far behind the Europeans when it came to the motor-car. They reported that by the end of 1900 5,386 automobiles were in France alone, 1,149 running around Paris.⁷⁰

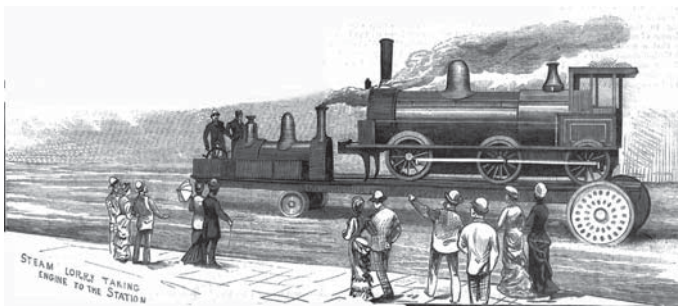


Fig. 2.15. Woodcut image of the Phoenix Foundry steam truck.

**The Australasian Sketcher. SLV
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The pioneer designers and manufacturers

While early automotive design and manufacture tended to comprise piecemeal one-off experiments, there were some attempts at serious production. The undisputed builder of Australia's first 4-wheeled motorcar was Herbert Thomson. Thomson can also be credited with driving the first 4-wheeled car in Australia and it appears he provided the vehicle in which Mrs L J Wilmoth became Australia's first female driver when she drove the Thomson car.⁷¹ This was about 14 years after Bertha Benz's famous 46-mile trip in the Benz patent motor wagon in 1888.⁷²

Herbert Thomson was born on 13 July 1870 to Henry and Isabella Thomson in Prahran Vic. His father had an established wheelwright business in High Street, Armadale, having first worked as a contractor installing coal producing bores at Yallourn and Altona. His son gained a mechanical appreciation working alongside his father and he then trained as an engineer, becoming interested in steam engines. At 19 he completed his first steam engine, installing it in a boat that plied the Yarra River.

In the mid-1890s Thomson established his steam engine and boiler workshop not far from his father's business at 835 High Street and was soon engaged in getting a motorcar operational.⁷³ (Fig. 2.16) While Thomson's exploits are well known, there are conflicting published accounts of the date that his first car appeared. Keith Winser provides a vivid description in *The Story of Australian Motoring*:

On a cold grey Melbourne day in May 1896, an excited young man opened the doors of the wooden shed next to his home, entered, and pushed out in New Street Armadale, a contraption the like of which had never before been seen in Australia. And with that act a great Australian Industry was born; for the young man was Herbert Thomson, a mechanic, and the contraption – Australia's first car.⁷⁴

Winser's account appears to be first-hand but impossible given that he was born in 1911. He went on to describe the large crowd that gathered to witness the lighting of the wick to the kerosene that soon provided sufficient steam to move the car forward. Winser described the car as a: "2-seater jinker sitting on four pneumatic wheels with a tiller steering, little more than a four-wheel bicycle".



Fig. 2.16. Herbert Thomson's workshop at 835 High street, Armadale with the pioneer Australian 4-wheeled car.

HH Paynting collection

According to Winser this vehicle was pitted against Harley Tarrant's imported 4½ hp Benz in late 1896. Several writers allude to this event, and John Goode set the date between 1898 and 1900.⁷⁵ The event was likely after March 1900 and involved Thomson's second vehicle.

Spectators of Thomson's activities included E H James, aged 19 and A E Browne, aged 9, who spent his Saturday mornings in Thomson's workshop where he first tinkered and then built his steam vehicles. Browne retained an interest in automobiles, later heading the Dalgety & Co motor department.⁷⁶ It may well have been Browne's recollections of Thomson's first drive that Winser retold in his book. E H James would later install a Thomson steam engine in a motor launch and design an armoured car.

The first Thomson car was probably cobbled together from bicycle parts that essentially provided a platform for his steam engine, boiler and seat. Having achieved mobility, Thomson immediately embarked on a more ambitious vehicle. It is recorded that before 1896 ended, Thomson was working on a 4-seater pneumatic-tired carriage.⁷⁷ (Fig. 2.17) Edward Holmes puts the date at 6 July 1896 when he recorded it ran in High street, Armadale.⁷⁸ This date is supported by W D Baxter of Strathbogie, who was employed by Thomson as an apprentice in 1896. On 6 July Baxter records that: "The vehicle was pushed across the footpath in High Street then into Denbigh Road [sic] With two very excited men on board, the Thomson Motor Phaeton covering an extremely erratic course; sped down at 12mph".⁷⁹

Baxter left Thomson in 1904 after five steam cars had been made. What Thomson had completed in 1896 was a 6-seater steam horseless-carriage with fiddle back ash and silky oak body by Armadale coachbuilders, Martin & King and engine castings made by T Main & Sons of Jolimont.⁸⁰ Goode claims Thomson was aware of developments in Europe, but had no data available to design and construct a car.⁸¹

The Thomson steam buggy bears some similarity to the 1893 Benz Victoria, the company's first 4-wheeled vehicle, although the Benz only seated two passengers. The next Benz in 1899, using a similar layout, seated four passengers but in a conventional manner where all face forward in two separate compartments, whereas the Thomson car seats two of the passengers facing to the rear. (Fig. 2.18) Gottlieb Daimler's first 4-wheeled car also seated all passengers facing forward and a year later



Fig. 2.17. Left. The Thomson 1897 car with Thomson driving, Holmes at rear and Thomson's wife and daughter.

The Australasian, 1897

Fig. 2.18. Above. The 1899 Benz.

Mercedes Benz

his 6hp Phoenix took on the principles of automobiles post 1900 including installing the engine at the front of the vehicle, following Panhard's example. Both the Benz and Daimler vehicles, like Thomson's, were heavy and wagon like, with large high wheels. Daimler's car on the other hand showed the way to the future with a transmission, steering wheel and chain drive to the rear wheels.⁸² From this analysis it can be seen that while initially Australia lagged behind Europe, by 1897 Thomson had at least caught up and his third car of 1901 reflected the trends emerging in Europe and America in 1899/1900.

One aspect has remained unclear, that is the design of the steam engine. Holmes suggests it was originally copied from an American motor launch but offers no explanation as to which evolution of the Thomson design was the copy.⁸³ Thomson's first car was based on bicycle parts making it lightweight and unsuitable to support a steam engine and boiler like that on the second vehicle of 1896. The second car's engine drawn by W Nicol in 1900, also differs to that used on production cars from 1901.⁸⁴ This engine shows a strong resemblance to steam engines built by American's Mason, Stanley and Locomobile companies from 1899, the major difference being Thomson's employment of a Joy's slide valve to switch the steam direction whereas the others used a Stephenson's valve. The similarity between the three American steam engines and Thomson's suggests they all had a common ancestor. (Fig. 2.19 & 2.20)

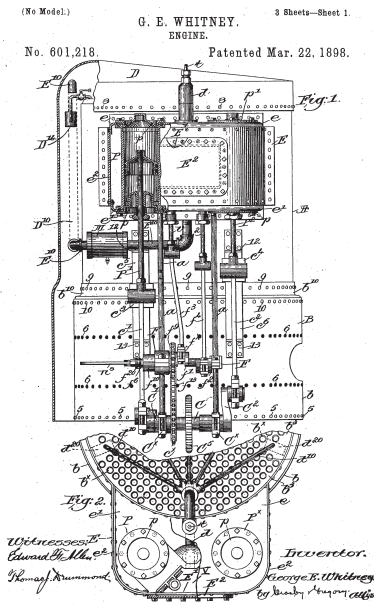


Fig. 2.19. Above. Two views of the Thomson steam engine as fitted to the 1902-5 vehicles.

N Darwin

Fig. 2.20. Left. The Whitney vertical steam engine influenced Mason, Stanley and Locomobile design and was perhaps seen by Thomson in an American steam launch.

US Patents Office

W W Beaumont discusses the light American steam carriages in his 1900 volume *Motor Vehicles and Motors* (1900):

Whitney and Stanley have both selected well-known types and have carefully developed them for their particular requirements, namely, the propulsion of light road vehicles by what they conceive to be the best means.⁸⁵

As both Mason and Stanley cars hailed from Boston, a good candidate for the ancestor is an engine produced by George Whitney who from 1885 was building light steam engines which after 1890 appeared in around 90 American steam launches.⁸⁶ Thomson also sold the Mason steam car and the Stanhope steam car that used a Mason engine. Therefore, there is a good case for suggesting Thomson’s original design was based on the Whitney steam engine of 1890.

In 1900 Thomson organised a draftsman, W A W Nicol, to draft the engine so that the plans for both the patent application and manufacture were available. (Fig. 2.21 & 2.22) Nicol had recently arrived from England when he took the commission and when asked by Thomson if he wanted to travel to Sydney with Holmes and the car, replied that he would rather go gold-dredging.⁸⁷ Holmes reported that the Thomson Phaeton cost about £150: “not more than an ordinary Brougham and a pair of good horses”.⁸⁸ Thomson’s steam engine fitted to the 1896 car was similar to his original

design. The biggest difference appears to have been between the 1896 engine and the production engine of 1900 which saw the piston valve moved from alongside the main cylinder to a separate slide valve position, which would have been made to improve lubrication in the valve.

The car was driven to the Malvern Cricket ground for its first public display 1 July 1899. It had been sighted previously on 1 June 1899 at St Kilda where it was photographed by the Melbourne *Leader* newspaper.⁸⁹ At this time it was certainly fitted with Dunlop's pneumatic tyres and was perhaps the first car in Australia to be so equipped. Dunlop's manager in Melbourne, W C Proctor, together with his advertising manager, Harry James, both keen motorists, had obviously come to know about Thomson's steam vehicle. Always looking to promote Dunlop's product, Proctor and James organised to hand make four large pneumatic motor tyres in their small Tattersalls Lane workshop.⁹⁰ Even though pneumatic bicycle tyres were on sale, the Dunlop motor tyres were not commercially available until after 1900.⁹¹

Following the first successful outing in Malvern, Thomson invited Edward Holmes to join him in a venture to make and sell his steam cars. Holmes, the son of Thomson's father's cousin, had no mechanical knowledge but had entrepreneurial skills. He convinced Thomson that to be successful they needed publicity, thus together they embarked on a trip to Sydney to display the car at the Royal Easter Show. The car was freighted by ship and subsequently won a special prize. Thomson's cousin, William Thomson, was a cycle dealer in Sydney and had organised a stand next to his own firm, Jackson Thomson Ltd.⁹² Buoyed by the Sydney success Thomson and Holmes decided to drive to the Royal Bathurst Show and then home to Melbourne.

While not the first overland trip by powered vehicle, it was the first by a 4-wheeled car. Billy Elliot had ridden and pushed a trike to Sydney in 1897.⁹³ This was possibly the powered trike owned by the Austral Cycle Co that had been shown in February 1897. Almost immediately the *Australasian* reported: "The Phaeton has been pronounced by persons lately returned from abroad to be equal in results and far superior in appearance and design to anything they had seen elsewhere".⁹⁴

Holmes wasted no time, setting up the Thomson Motor Car Syndicate with himself as Managing Trustee and four other trustees, Kelburne E

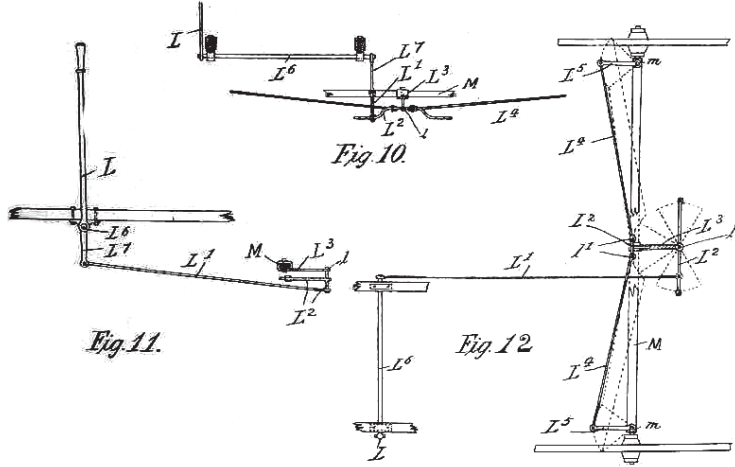
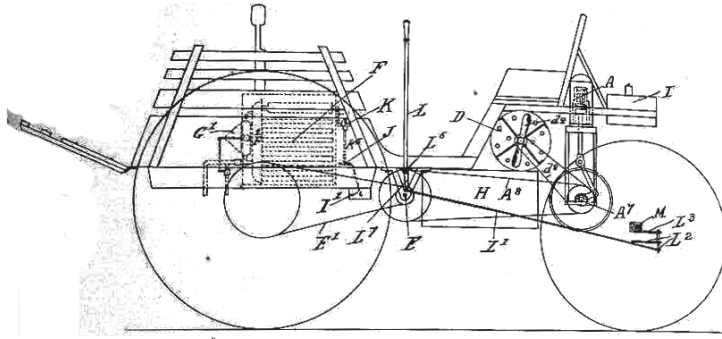


Fig. 2.21. Left. The Thomson 1897 patent drawing showing the mechanical layout with the engine mounted under the driver's seat.

The Thomson 1897 patent drawing showing the steering layout.

NAA - Australian Patent's Office

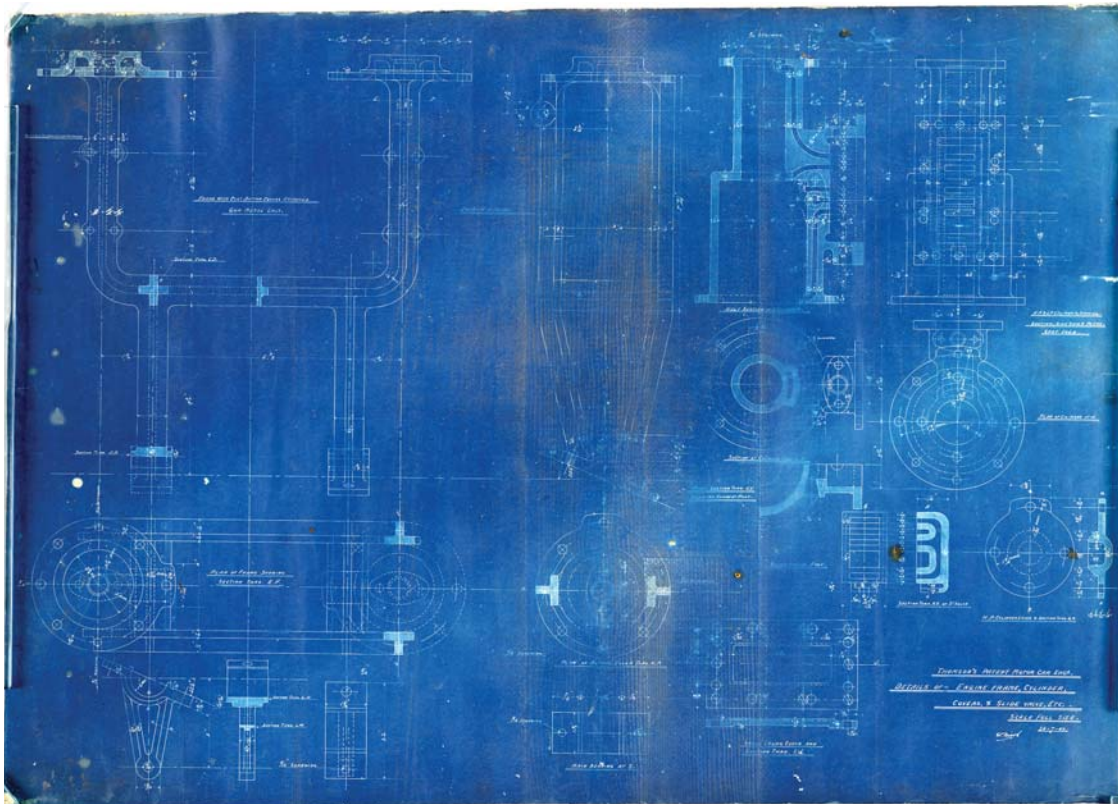


Fig. 2.22. Drawing of the Thomson steam engine drawn by Nicol.

Powerhouse Museum 95/260/1-1

Edge of the Austral Cycle Co, S G Pirani, Solicitor of Braliam & Pirani, E G Wilson and F H Mount. An office was established at 305 Flinders Lane. At their first meeting on 29 March 1900, the Syndicate agreed to form a limited company with capital of £2,000 in 200 £10 pound shares. They also agreed to patent the car in all capital cities, England, America and Canada.⁹⁵ On 18 June 1900 the Thomson Motor Car Co Ltd was incorporated in Armadale. The new firm purchased Thomson's patent, (no. 10086) *Improvements in the motor car, generator, condenser and controlling appliances of motor cars*, dated, 5 April 1900, for £1,500.⁹⁶

In 1901 *The Australasian Coachbuilder* described the car (Fig. 2.23):

The engine is a double compound condensing engine, with cylinders 1½" x 3" and 3" x 3" stroke, and weighs 62lbs. It works up to 10hp. The four cylinders are operated by two valves which are claimed to give far greater efficiency than any old type engines. The boiler, Thomson's patent steam generator, is about 1½ cubic feet over all, and has about 27 square feet heating surface. The engine is geared 2 and 3 to 1 back axle with Brampton ½" X 1" pitch chains. Speeds may be changed and the engine allowed to run free, the clutch being easily operated from the driver's seat. It is provided with water and kerosene tanks sufficient to run 50 miles without re-charging. It has an efficient copper condenser. The kerosene furnace is capable of raising steam in five minutes, and is automatically controlled by a patent self-acting regulator, which cuts off completely at a given pressure. The speed is up to twenty miles per hour, and it is claimed that it can climb grades up to 1 in 5. The Thomson Motor Company are asking £300 for this vehicle.⁹⁷

Nicol added:

The high pressure and low pressure cylinders attach to the same rod. Being an inverted type, the high pressure cylinder was on top and both were controlled by the same slide valve. The steam was admitted to the high pressure cylinder and at the completion of the downward stroke, was diverted by the slide valve into the low pressure cylinder, pushing it up, it was then exhausted. There were two of these cylinders side by side. The boiler was of the tubular plate type, raising steam in a very short space of time.⁹⁸

According to former employee, Baxter, the high pressure side could reach 1,000lbs per square inch and that the car carried 20 gallons of water and 12 gallons of kerosene.⁹⁹



Fig. 2.23. The Thomson Motor Co steam car of 1901. The body was still based on a Stanhope buggy design however it now resembled an automobile rather than a horseless carriage.

The Australasian Coachbuilder & Wheelwright, July 15 1901

Once Thomson and Holmes were back in Melbourne, plans for motorcar production commenced with Holmes establishing a showroom and organising the printing of a booklet *The Pioneer Motor Car Trip of Australia*. The partners then embarked on an improved, much lighter steam car, that was completed in May 1900.¹⁰⁰ Holmes is recorded as having driven this vehicle to Ballarat, where he had started to promote the car's potential.¹⁰¹ Moving the vehicles between the showroom in Flinders Street and factory in Armadale was not without obstacles. On 26 April 1905 Thomson's apprentice, Aubrey Lock, was fined, having "furiously driven a motor car in Flinders Street".¹⁰² His excuse was that he was blowing steam which necessitated a run at high speed for a few yards".¹⁰³ There was no conviction. Lock became a motor engineer in the Australian AIF in June 1916 and was later involved in building the Robbins & Porter monoplane in 1913.

In its 1902 catalogue the Thomson Motor Car Co showed a new 2-seater steam car and seven other imported makes. The Thomson car was produced in at least three formats, a basic hooded buggy at £175, a Royal hooded buggy (named after the Duke of York following his visit in January 1901) and a postal van used in a trial by the Post Office. (Fig 2.24) Thomson and Mr Lenne of the Post Office cleared 40 pillar-boxes in a 30-mile run through St Kilda, Malvern, Prahran and Caulfield in 1 hour 45 minutes.¹⁰⁴ Goode suggests that 10 Royals were built from an order bank of 150 and he concludes that the last Royal was made in 1904.¹⁰⁵ This model was still being advertised in June 1905.

A year later, Holmes diversified his interests, setting up the Melbourne School of Motoring and a used car business, the Motor Mart, at 103 Exhibition Street. Not only did Holmes offer driving lessons but his partner, W F Lally, provided tuition on motor maintenance.¹⁰⁶ Holmes also became the secretary of the Automobile Club of Victoria.¹⁰⁷

The 1906 Prahran directory lists Thomson's works: "Thomson's large motor works in High Street (near the railway station, are proof of what can be accomplished by Australian brains and skill and pluck".¹⁰⁸

The directory also noted that Thomson was an expert motor valuator for the Australian Customs Department and direct importers of all kinds of vehicles, parts and accessories and repairers to the British car agencies. As it makes no mention of a Thomson steam car for sale it is obvious that by the end of 1905 the sale of Thomson steam vehicles had waned, and in September of that year the company was introducing new shipments of English cars and the Stevens-Duryea car from America.¹⁰⁹ The Thomson Motor Co went out of business around 1907 but Thomson kept working on steam engines, general auto repairs and fire engines for the Melbourne Fire Brigade.¹¹⁰ There exists in the National Steam Centre a vertical engine purported to be a Thomson stationary steam engine, that has been modified at some time by adding a second upper cylinder. A second engine powered a carousel at St Kilda beach. (Fig. 2.25 & 2.26)

Was a steam-powered car the right direction? Holmes advocated the case for steam over other fuels in an introduction to a reprint of the Bathurst to Melbourne story in the Thomson steam car, in Pollard's (1974) *One for the Road*.¹¹¹

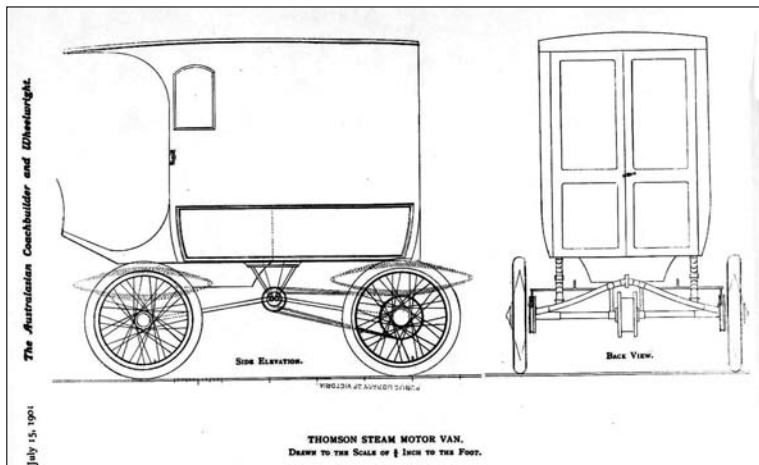


Fig. 2.24. The Thomson Motor Co postal van of 1901.

The Australasian Coachbuilder and Wheelwright, July 15 1901, 71

Holmes must have been referring to the production car, as petrol was not readily available when Thomson built the first two experimental cars, whose early oil engines ran on kerosene. Electric cars were known in the early 1900s and Sydney Stott, founder of Stott's Business College, imported an electric De Dion-Bouton in 1902. Electric cars, however, required a means to charge their accumulators (batteries), there were few charging stations available.¹¹²

Despite Holmes's defence of steam, the car's reliability was not a hundred percent. Mr Creagh, a New South Wales grazier, ordered a Thomson after seeing the steam car in 1900. It was shipped to Sydney and driven to Newcastle where Creagh was waiting to drive it to Maitland. Creagh records:

Reports on the car were not satisfactory, but later I heard improvements had been made, and (after) a favourable report from a Melbourne friend, my order was given. The car had two cylinders and fitted with a Joyce's reversing gear instead of ordinary slide valves. The engine was under the seat and steam and hot oil fumes came up between the seats. It had two kero Dietz lamps and tiller steering that was jointed to allow entry.¹¹³

Creagh described the trip as very slow and trying:

There were constant stoppages on hills waiting for steam pressure...occasionally flames came out the rear flue scorching one's hair.¹¹⁴



Fig. 2.25 & 2.26. Two versions of Thomson stationary steam engines. Left. A vertical unit at the National Steam centre Melbourne and above the 1914 carousel engine made for the St Kilda council and now in Canberra.

W Bryce

N Darwin

After some debate with the Thomson representative about fixing problems, Creagh diverted to Newtown and had a mechanic make it good". The car continued to give trouble and Creagh had the engine exchanged for a petrol job.¹¹⁵ The engine was, in due course, donated to the Powerhouse Museum in Sydney along with Nicol's four blueprint drawings.

A contemporary of Herbert Thomson, Harley Tarrant initially resided in Grey Street, East Melbourne and he too began to tinker with an automobile. Tarrant's first effort was not successful and little is known about it. Tarrant said of the vehicle:

While continuing my surveying I started designing and experimenting on the lines of explosion (internal combustion) engines. About this time I produced my first car, with a 2-cylinder horizontal engine in the rear, chain to a counter shaft, and chain driven, but this car never really got on the roads. After this I started building light comparatively high speed oil engines.¹¹⁶

Max Gregory suggests this first car could only operate at 2mph and only for ½ hr at a time and was scrapped before it ran 10 miles.¹¹⁷ Its engine was a horizontally opposed 2-cylinder petrol engine but no evidence of this design has been found. Tarrant's second engine was a conventional 2-cylinder.

Harley Tarrant was born at Clunes on 6 April 1860 to Joseph, a printer and publisher, and Caroline. His parents had emigrated from Oxford United Kingdom to Clunes, Victoria. Tarrant was articled to a firm of surveyors and civil engineers and worked outback in Australia. He became an authorised surveyor for New South Wales Lands Department, based in Broken Hill. Tarrant also inspected the Broken Hill silver lode prior to the BHP float in 1885.¹¹⁸ In 1886 he proposed a Hay-Deniliquin private railway that required access to a strip of land between the towns. The New South Wales Minister for Lands, Mr Lyne, refused the request.¹¹⁹

Perhaps dejected Tarrant came to Melbourne with his family in 1888, initially running a civil engineering business with his brother, Joseph. Studying mechanical engineering part time Tarrant established a small business, The Tarrant Motor and Engineering Company, in a workshop loaned to him by F S Grimwade at 282 Post Office Place, Melbourne.¹²⁰ In

1907 *Punch* put Tarrant's company beginnings in 1890 and stated he was successfully manufacturing kerosene engines and launch engines. An EST 1890 was later cast into the masonry at the 108 Russell Street head office of the Tarrant works. Gregory, however, suggests the 1890 was not the Tarrant Company start date but his partner's, Howard Lewis.¹²¹

It is known that the Tarrant works were producing a 2hp oil (kerosene) engines and in early 1898 they cost £33. These stationary engines were sold to farmers and were mainly used to operate pumps as they cost just 2-pence per hour to operate.¹²² The Tarrant stationary engine was designed along the lines of the first imported engines in that the cylinder was horizontal with the piston rod spinning two flywheels. Tarrant's engine had several unique features. The combustion chamber was blind, this meant the head was not removable and the hot tube ignition was fitted to an unusual gooseneck bolted to the underside of the cylinder chamber. Just two stationary engines of this type are known to have survived.¹²³ (Fig. 2.27)

Tarrant used Messrs Payne and Sons of Melbourne to produce engine castings for his engines.¹²⁴ He claimed that kerosene was safe, cheap and readily available. Electric power meant recharging a battery and steam was dangerous and made a vehicle very heavy for running on rough country roads.¹²⁵ Tarrant lodged a patent application (no. 14959), *Improvements in Explosion Motors operated by gas, oil or like fuel* on 10 February 1898 that essentially added a pre-ignition chamber to eliminate the need for a hot-tube.¹²⁶ (Fig. 2.28)

By 1899 Tarrant had acquired a Benz and a De Dion-Bouton agency and began importing Benz vehicles and engines as well as three De Dion-Bouton tricycles. In 1899 M O'Farrell was established as manager of The Australian Automobile Company in William Street to handle the Benz and De Dion-Bouton sales and act as a Tarrant agent. *The Australasian Coachbuilder and Saddler* suggested Tarrant intended to produce the Benz locally.¹²⁷ (Fig. 2.29)

In this period engines were either running on kerosene or American Gasoline. The first petrol, fifty gallons of it, arrived on 4 July 1899 aboard the SS Buteshire from the London firm of Carless, Capel and Leonard. The importer was F B Roche of Bennett, Wood & Roche, importers of bikes and later motorcycles. Roche sold out his interest in the firm in 1910 and eventually became Tarrant's managing director.¹²⁸

Previously, in late 1897, Howard Lewis had joined Tarrant in partnership. The firm, now The Harley-Tarrant Motor Syndicate was relocated to 108 Russell Street, Melbourne. Stationary engines continued to be built at Post Office Place. The pair began building the second Tarrant, describing it as: “a car with a 2-cylinder vertical engine in front, the transmission being more along the lines now used in modern cars”.¹²⁹

Harrison, editor of the *Australian Motorist*, recorded the development of the car, he noted that Lewis and Tarrant were secretly constructing a self-propelled road buster around 1898: “Its construction was secret and its first trial took place at 2 o'clock one morning, when prying eyes would be fewer. It attained a speed of 4 miles per hour on down grades”.¹³⁰

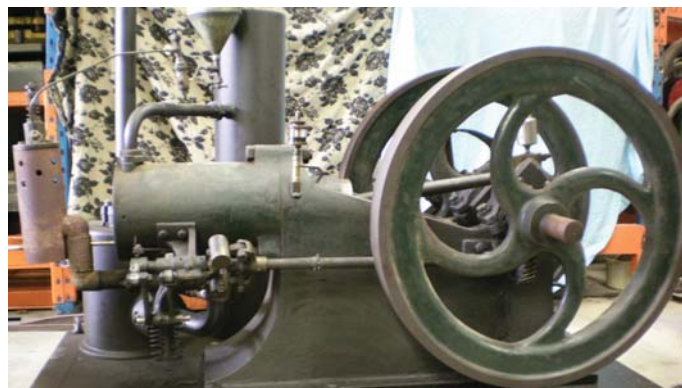
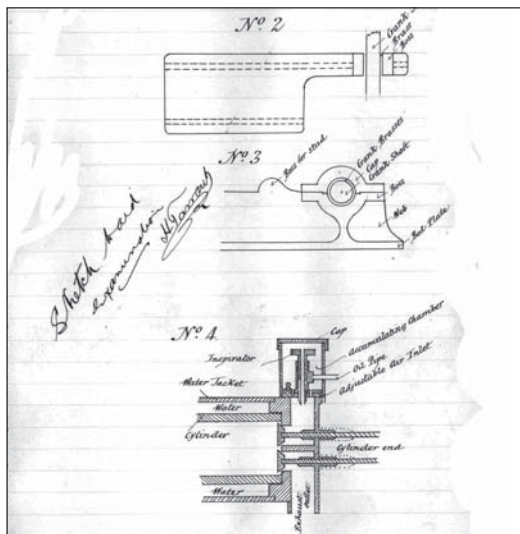


Fig. 2.27. Above. Tarrant 6hp stationary engine c1902. An engine similar to this ran the Tarrant workshop, initially using a hot tube ignition the engine ran a 10-inch and 6-inch lathe, two drilling machines, a hack saw and forge blower.
P Kimber

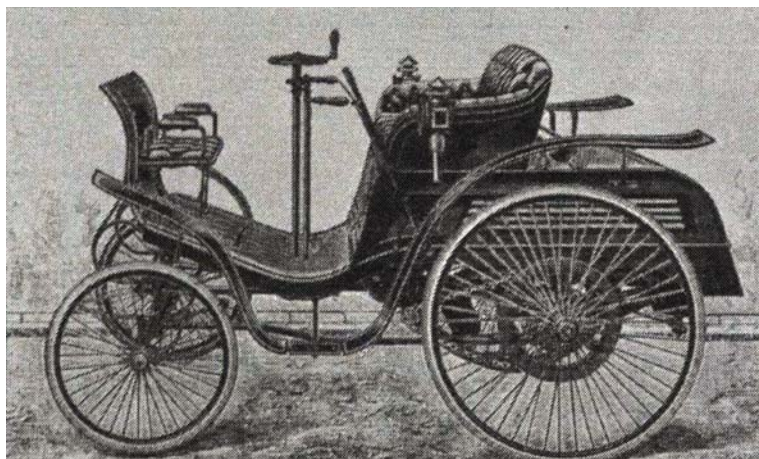


Fig. 2.28. Left above. Harley Tarrant’s rough sketch of his stationary engine pre-ignition chamber and valves provided as part of his patent application.
NAA- Australian Patent Office

Fig. 2.29. Left. 1899 Benz imported by M O’Farrel direct from Germany for Harley Tarrant who proposed local manufacture. Shown as an “Ideal” it is a Velo Comfortable, built 1898-1902.

The Australasian Coachbuilder & Wheelwright, Feb 1900, 218

On another run the brakes failed in Elizabeth Street, Lewis jumped off the car and together with engine braking and brute strength brought the car to a stop.¹³¹ Early images show a finned tube radiator at the front and a bonnet, later modified, shows vent slots indicating additional cooling was required. Upon completion publicity was organised in the Victorian papers:

A fine motor car has just been turned out in Melbourne by the Tarrant Motor Co. to the order of a gentleman in the cycle trade. The car, with seating accommodation for four persons, is built on the Tonneau pattern, and is fitted with a petrol motor of 6 horse power, giving an average speed of about 20 miles an hour on fair roads. Taken as a whole the car reflects great credit on the manufacture, and should certainly prove the runner for many orders, as the Tarrant car is not only built for speed, but is designed and manufactured to stand plenty of hard driving on rough roads.¹³²

Subsequently sold to W H Chandler on 28 September 1902, this vehicle was powered by a 5hp Benz petrol engine with a 3-speed transmission. This second car had been completely redesigned by Tarrant and Lewis and the firm had spent £2,000 developing the new engine, transmission and drive line. The car was assembled by Tarrant's workshop foreman, Charles Perrin and a motor body, said to be Australia's first purpose built motor body, was built by Alex Smith, then employed at the Clifton Wheel Works.¹³³ (Fig. 2.30)

Punch described the second car:

The Tarrant car, in spite of its crudeness, had good material in it, and was well fitted together, so that after a number of trial runs and a few alterations in detail it was handed over to its delighted owner. In 1903 the chain was replaced by a live axle and prop shaft.¹³⁴

By 1900 the Tarrant Motor & Engineering Company showrooms were moved to William Street Melbourne and manufacturing to 15 Queens Bridge Road, South Melbourne, in February 1900 (next to Queen's Bridge). By December 1902 Tarrant modified the design of the 1900-1901 car, installing a 2-cylinder Tarrant engine, extending the rear opening Tonneau bodywork and fitting wooden spoke wheels, turned up front fenders and fluted engine side cover. The 3-speed transmission, 2-cylinder Tarrant engine was rated at 5hp and had an 80-mile range at 25mph. An image of this vehicle appeared in *The Scientific Australian*.¹³⁵ (Fig. 2.31)

Six months later Tarrant had redesigned the Tarrant car and taken new orders for two 8hp cars (no. 4 & 5) for F Grimwade and Leslie McPherson of Balranald, New South Wales. (Fig. 2.32) A third car would be fitted with a larger engine rated at 10hp (25bhp) and capable of 50mph.¹³⁶ In early 1904 the company moved again, consolidating in Exhibition Street where up to 40 cars could be accommodated.¹³⁷

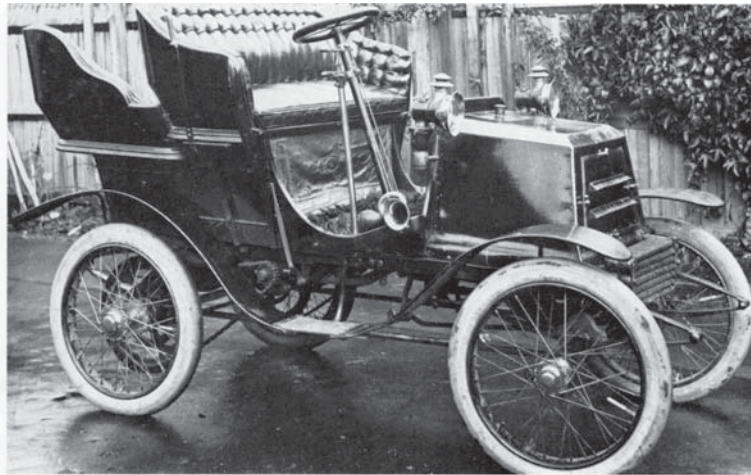


Fig. 2.30. The second Tarrant car, body produced by Alex Smith and sold to W H Chandler. This first production design took two years to develop, this image shows two cooling vents at the front, there are also images of one vent and no vents indicating cooling was initially an issue.

RACV Tarrant Archive

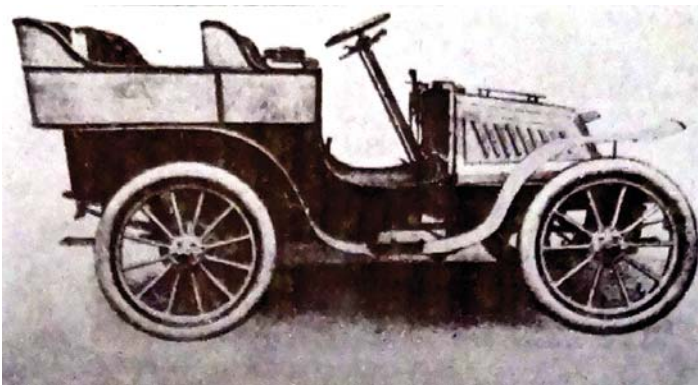


Fig. 2.31. The third Tarrant car (1902) with a rear entrance Rotund body.

Scientific Australian, Dec 20 1902, SLV

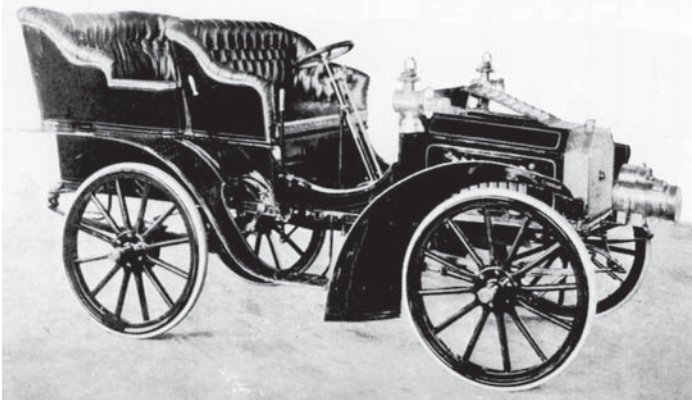


Fig. 2.32. 12hp 2-cylinder solid tyred Tarrant car (no. 5) with rear entrance Tonneau body built for Leslie McPherson in 1903.

The Coachbuilder Book of Designs 1909 Plate 629

Howard Lewis, a trained engineer, was born in 1869 and was the son of an English sheet metal worker, Jonah Lewis. The Lewis family emigrated in 1880. A talented bike rider, he established a cycle business in Elizabeth Street with Ernest Beauchamp in 1890, who was said to have done nothing remarkable with it. He then partnered with Charles B Kellow in 1893 and the pair began to be recognised, forcing a move to larger premises in Swanston Street the following year.¹³⁸ Kellow did not fancy participating in automobiles at that time so Lewis sold his share to Kellow and joined Tarrant in late 1897 as a partner (the Lewis sale did not go through till March 1898).¹³⁹ Lewis was also instrumental in building a new two storey works in Russell Street and tolerated the jibes from the establishment that said the building would become “A white elephant” and that the motor car was “A silly man’s hobby”.¹⁴⁰

The third partner of the Tarrant Motor Company, William Ross, was born at Penshurst, Victoria 1875 to William and Amelia Ross.¹⁴¹ Initially educated as a civil engineer, in 1899 Ross departed for England to gain four years practical experience. He took an apprenticeship with Ferranti Electrical Engineering Company, then worked for Callender’s Cable Works before joining the Hozier Engineering Company in Glasgow, makers of the Argyll motor car. In 1903 Ross left Hozier for Australia, armed with a slightly damaged car and the rights to sell Argylls in Australia. He approached Tarrant and Lewis with the Argyll agency and they immediately formed a partnership, adding Argyll to Benz (Mercedes), Rover and De Dion-Bouton.¹⁴² From this time Tarrant vehicles took on design features found in the 10hp Argyll.

The three partners settled into separate responsibilities, Tarrant looking after the engineering, Lewis the merchandising and Ross the overseas ordering and negotiations. An early problem for the company was the supply of motor bodies suitable for their imported and local cars. Many imported cars arrived as a running chassis; Doreen Holmes suggests this was almost 80% of them.¹⁴³ By 1903 Alex Smith had left the Clifton Wheels works and established his own body shop in South Melbourne, working as a trade body-maker.¹⁴⁴ Approached by Tarrant in 1907 Smith sold the business and Tarrant created The Melbourne Motor Body Works in Exhibition Street with Smith as the workshop foreman.¹⁴⁵ Also taking up positions in the new company were Smith’s former employees, S Jewell a painter, J Wyatt a blacksmith and W Rolland a trimmer.¹⁴⁶

In the first half of 1903 the Tarrant firm developed their new car (third car built) and with the Argyll imported by Lewis close to hand they were able to make improvements based on the Argyll design. Tarrant was also prepared to provide customers with a specific design. In March 1904 the business was operating from 103-5 Exhibition Street and was able to offer the charging of accumulators (batteries) since a large dynamo had been installed.¹⁴⁷ Tarrant was also quick to grasp any publicity opportunity. On 12 March 1904 the newly formed Victorian Automobile Club (later the RACV) organised a race meeting at Sandown Park, and Tarrant entered his 2-cylinder car, easily winning against imported makes with an average speed of 26.1 mph. (Fig. 2.33)

Two of the Tarrant 2-cylinder 12hp chassis were built with van bodies, one delivered to Fenton Grimwade & Company in 1905 and one used by the Herald newspaper. The Grimwade van was used for deliveries and could carry 2-tons up the Bourke Street hill on solid tyres and was fitted with a body built by Burton & Knox of Melbourne.¹⁴⁸ In the period 1901 to 1905 Tarrant produced five chassis of similar 2-cylinder design. Changes were made, for example, a vertical honeycomb radiator was fitted rather than the finned copper tube. The first car (no. 4) with a vertical radiator was sold to F S Grimwade and shows a layout similar to the Argyll. (Fig. 2.34 & 2.35)

In 1904 James Flood arrived from England, joining Tarrant's body works with the latest English body building techniques at hand. Flood was able to later (1907) produce the first fully enclosed body for Dr W K Bouton on a De Dion chassis. (Fig. 2.36) A 14-16hp 4-cylinder 8-foot 10-inch wheelbase Tarrant chassis was sold to Jack Wallace who had Daniel White build a Brougham body with a removable top. (Fig. 2.37)

In 1906 Tarrant announced a new chassis for both 2 and 4-cylinder engines. A 2-cylinder car cost £375 and the 4-cylinder cost £750, and both were identified with new radiators with a brass ring in the centre. One week prior to the Melbourne to Sydney Reliability Trial (November 1906), one 2-cylinder 8-10hp car (car No. 12) and one 4-cylinder (car No. 11) of newer design were completed at the newly erected Russell Street factory, said to be the finest motor car premises in Australia and pronounced as equal to London ones. The 2-storey premises comprised showrooms, garage, parts counter and body shop. *Punch* said of the Tarrant car: "When

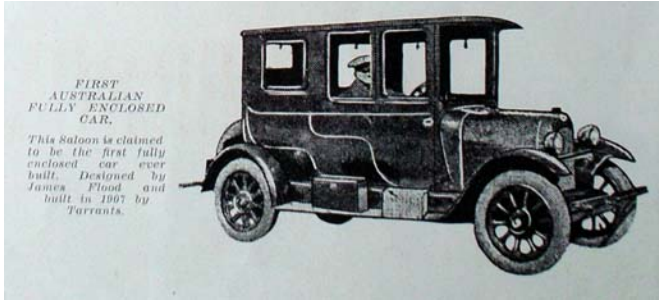


Fig. 2.33. Above. 1904 Tarrant 2-cylinder 10hp (no. 6) that competed at Sandown Park, winning the class.

RACV Tarrant Archive

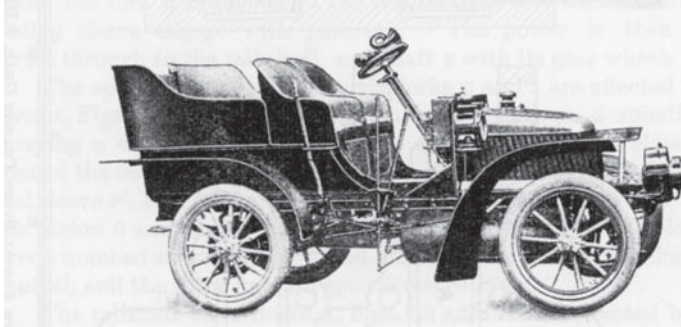


Fig. 2.36 Left top. First totally enclosed body produced in Australia by James Flood while working for Tarrant's body shop, Melbourne Motor Body Company in early 1907. The body was fitted to a De Dion chassis, the first of three chassis to carry the body over 25 years. This is possibly the 2nd chassis c1920.

The Coach & Motor Body Builder April 1940, 12 and 15.



Fig. 2.34. Left above. 1903 10 HP Argyle light car produced by the Hozier Co.

Motor Vehicles and Motors, 48.

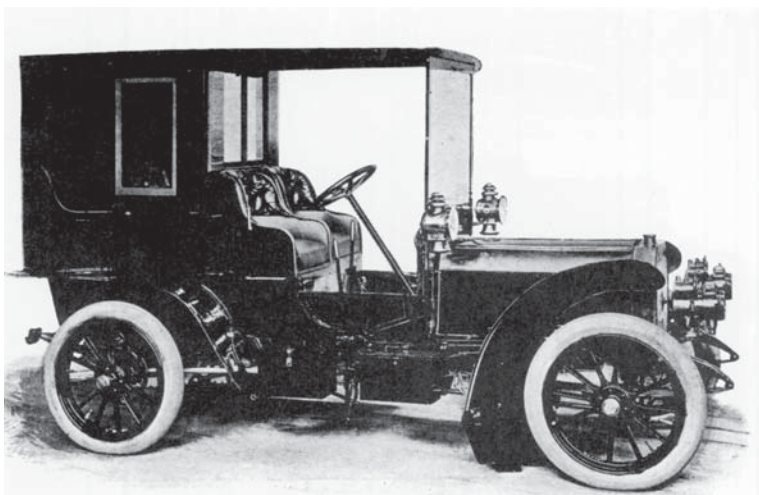


Fig. 2.35. Left above. 1903 Tarrant 2-cylinder 8hp car (no. 4) produced for F Grimwade. Note chamfered radiator, this denotes the second evolution of Tarrant design.

RACV Tarrant Archive

Fig. 2.37. Left. Dan White produced this partly closed Brougham body on a Tarrant 4-cylinder chassis (no. 11) in 1905. Car sold to Jack Wallace was the first 4-cylinder.

The Coachbuilder Book of Designs 1909 Plate 629

bodies produced are placed against the imported article, one cannot but acknowledge that, value for value, the local body is not beaten by the imported one".¹⁴⁹

The two cars were entered in the Sydney Reliability Trial. One car driven by Tarrant repeated his 1st place in the 10-12hp class gained in the 1905 event and the second 4-cylinder car, driven by Russell Grimwade, won the large car class with an average speed of 26mph. Grimwade said that he had spent a good deal of time in the workshop and made quite a bit of the car himself over a 12-month period.¹⁵⁰

A description of the third series 4-cylinder Tarrant car in 1905 said the forged steel H-section front axle was "very strong in the jaws".¹⁵¹ From detail in the RACV Tarrant archive, two 3-cylinder engines, made by White & Poppe, were fitted prior to the 4-cylinder chassis being built.¹⁵² The rear axle ran roller bearings and spur differential gearing with special steel axles, all located with radius and torsion rods. The chassis was narrowed at the front to provide a greater turning circle. The engine measured 92mm bore and 120mm stroke and at 1000rpm achieved 14hp with 23bhp estimated. (Fig. 2.38)

The Tarrant 4-cylinder engine cylinders were separately cast with large water jackets, and valves were mechanically operated with a camshaft on the exhaust side providing across-flow head design. The camshaft also employed the water pump and high-tension Simms-Bosch Magneto that delivered power to the exhaust side plugs. A separate ignition system, for the inlet side plugs, was powered through a battery and delivered via a low-tension accumulator and hi-tension distributor with a single coil. This odd ignition system eliminated wiring and possible shorts. The thermo syphon cooling system was only used on 2-cylinder cars and was very efficient using a fan and honeycomb radiator. The crank was made from a solid forging with 5-bearings, it was built for our very rough roads and not solely for speed.¹⁵³ It is clear the 4-cylinder Tarrant engine closely followed European trends including those employed by Argyll. Unknown is the source of the 2-cylinder engine design made some 4 years earlier. The 2-cylinder engine has no published description and no examples exist to date to enable a comparison with engines of the day or with the later 4-cylinder engine. (Fig. 2.39)

In 1907 the Tarrant Company ceased to be an automobile manufacturer but continued to build stationary and marine engines. A 60hp engine was installed in the Bona , a racing yacht and a 40hp engine sold to the Colonial Ammunition Company for a 20-ton barge. The Seaman's Mission also used a 16hp 4-cylinder engine in their boat.¹⁵⁴ While the marine engine business continued, the small kerosene engines declined as there was insufficient demand to warrant the effort.¹⁵⁵ The number of agencies had increased to nine with Fiat, F.N., Sunbeam, Thornycroft and Commer added. (Fig. 2.40)

The manufacture of automobiles had proved to be too expensive. According to Ross it took three or four months to build a car: "If we had built any more the company would have gone out of existence".¹⁵⁶

Nevertheless the end of the Tarrant car opened new possibilities for the company with the entry of the Ford car in Australia. Doreen Holmes, Tarrant's daughter, suggests this was early in 1907. Holmes quotes

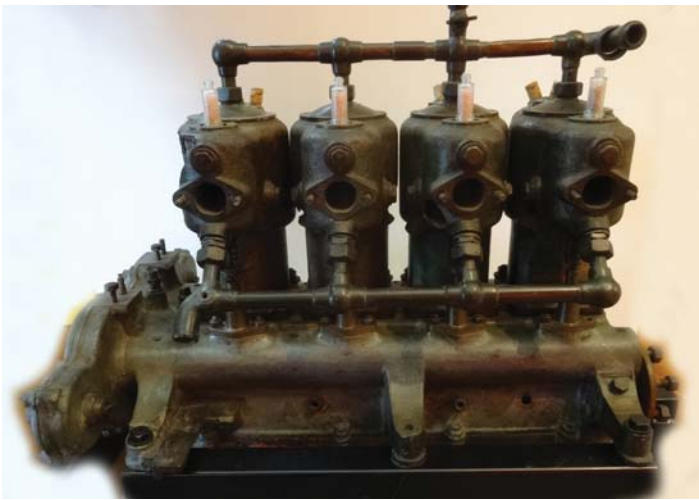


Fig. 2.38. A 4-cylinder Tarrant engine.

N Darwin



Fig. 2.39. One of the last Tarrant cars to be produced, a 4-cylinder 2-seater c1906.

RACV Archive

the Tarrant sales manager, Maurice Shmith's recollection that a Ford representative arrived with a book of pictures and wanted them to take up the agency for Victoria, The car was the S Model and Shmith thought it revolutionary and signed immediately.¹⁵⁷ Shmith's version ties in partly with that of Arthur Davies, the Sydney Ford agent, who had in May 1908 passed through Melbourne on his way to England, taking the opportunity to see Tarrant and show them the Model S Ford: "They turned it down flat", Davies said, yet after much discussion they agreed to order two cars but when Davies returned from England in December no further orders had been made.¹⁵⁸ Following the release of the T Model Ford, R J Durance, a Canadian Ford representative, approached Tarrant driving a sample car. The directors found that it was not as flimsy as it looked and Durance convinced Lewis to travel with him on a selling trip round Victoria. On return they had 200 orders and Tarrant embarked on their most profitable agency.

The motor industry continued to grow until in 1912 the motor dealers agreed a motor show should be organised. Held in Melbourne's Exhibition Buildings it was a great success. Trade stands were balloted and the Tarrant Motor Company won the first pick, choosing the prime site under the great dome. A report following the show said of the Tarrant stand:

The Tarrant Company has manufactured many cars, which to this day are still running side by side upon an equality with the best of British and foreign cars. Bodies built in their immense establishment are quite equal to or rather better than motor carriages built on the other side of the world.¹⁵⁹

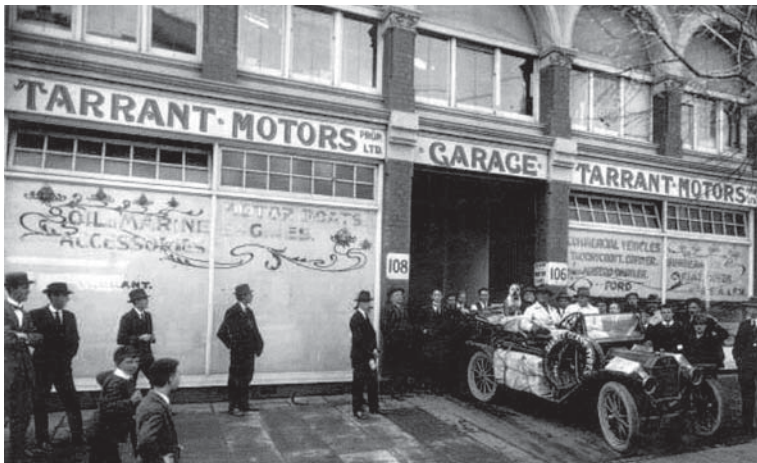


Fig. 2.40. The Tarrant company works in Russell street, Melbourne turned out hundreds of T Fords using Melbourne Motor Body Works bodies and locally assembled chassis.

RACV Archive

The Tarrant Company boomed following the introduction of the T Model Ford. By 1910 they had become the distributor of Fords in Victoria and controlled the distribution of spare parts to Ford agents. Early in the distribution Lewis realised he could make savings by having components omitted from the Ford shipment packs. Initially resisted by Ford Canada, local parts were gradually introduced, the biggest being the body.

In 1917 an unwell Harley Tarrant tired of the car business and retired as a director. The business was subsequently reorganised into Tarrant Motors, Autocar Industries, Allied Motors (Melbourne Motor Bodies was a subsidiary), Olympic Motors and the spare parts business, Brooklands. In 1930 the Melbourne Motor Body and Assembling Company was renamed Ruskin Motor Bodies Pty Ltd and the firm was eventually sold to Austin Motors in 1948.

Any comparison of Australia's first two commercially sold cars is difficult. While both were constructed and sold in the same period they were very different automobiles. In addition to having different power plants and drive mechanisms the Thomson remained unchanged, while the Tarrant evolved from a horseless-carriage to a recognisable automobile. Both unfortunately suffered the problem of profitability. Pedr Davis suggests that Thomson's failure to produce more cars was not due to a lack of orders but rather the inability to fulfill them, because he was hand building them.¹⁶⁰ By 1901 Renault and Oldsmobile were using mass production techniques enabling the cost of their cars to be dramatically reduced. Davis also asserts that Tarrant had a plan to increase production of the 4-cylinder chassis, but nothing eventuated as evidence exists that only four 4-cylinder cars were produced. Thomson took seven years to build 12 cars and Tarrant made between 14 and 16 in the same time (See Table 2.1).¹⁶¹ There is no evidence that either manufacturer made any attempt to build the vehicles other than one at a time by hand. In the end both were losing money on their efforts and more money was to be made from selling imported vehicles.

Henry Sutton can be classed as an automobile inventor and designer rather than a manufacturer whose achievements were considerable and internationally recognised. As an inventor he produced a number of automobiles of his own design in an evolutionary process (somewhere between six and eight). Sutton was born to Richard and Mary Sutton in Ballarat in 1855. His father had established a music store on the Ballarat

Goldfields in 1854.¹⁶² He was a precocious student, first at the Ballarat School of Mines where he scored a 1st prize against many students in an examination, and then at Ballarat School of Design.¹⁶³ By the age of 17 he had produced a string of inventions and research papers on flight, batteries, wireless telegraphy, an electric dynamo, phone system and others.¹⁶⁴ He was also a talented model and apparatus maker and completed his own drawings.

When the bicycle craze entered Australia in the 1890s, Sutton and his brothers added bike agencies to their music business. This not only provided additional income as the 1890 depression deepened but it gave Sutton an additional field in which to work. His son, Arthur, became a young bike competitor and so Sutton became interested in the subject of bike pacing, particularly when engines were fitted to the pacers. This focus on automobilism (initially trikes and bikes), as described by *The Cyclist, Tourist and Traveller* in 1899, led Sutton to first purchase a Beeston De Dion-Bouton powered trike and then design his own air-cooled 2-cylinder engine. He first investigated an electric motor and battery but realised an oil engine would be cheaper, less complicated and free from danger.¹⁶⁵

Sutton had also seen automobiles being driven around London when he was there from 1890 to 1893 and so recognised their potential. His first task was to design a better engine.¹⁶⁶ (Fig. 2.41) After several years of experimentation he had a patent written and engine underway. The patent, (no. 15777) *Improvements in and relating to internal combustion engines* was lodged in Victoria on 7 December 1898.¹⁶⁷ With a design completed, Sutton contracted John Mennie, a mechanic, to supervise its manufacture and fitment to a modified Wallis & Sampson tandem bike frame. The 150lb air-cooled benzene fuelled engine gave 3hp @ 1,200 rpm. Mennie had Mr Dixon make patterns from Sutton's drawings and then contracted John Payne & Son's foundry to cast three sets of parts. These were machined by Mr Anderson, *The Cyclist* described this as "heavy work", and assembled and tested by Mennie in his spare time at home.¹⁶⁸

In comparison to the imported De Dion-Bouton air-cooled engine, the Sutton engine was considered far superior. The 1-cylinder De Dion-Bouton was rated at 1³/₄ hp and had a hot-tube ignition that meant a varied propelling charge, in other words the speed continually fluctuated depending on the amount of fuel and air being sucked into the cylinder. Sutton estimated the De Dion-Bouton wasted about 40% of its fuel and

this meant the two pacing riders had to peddle like mad to maintain a constant speed. The Sutton pace riders did not even need to pedal once the bike was underway as the 2-cylinders and Sutton's patented surface carburettor supplied an adjustable amount of fuel and air. Thus, in mid-1898 Sutton successfully marked the debut of his pacing tandem at the St Kilda bike meeting.¹⁶⁹ After several months of further development Sutton gave the pacing bike to Dunlop for pacing purposes and turned his attention to a 4-wheeled automobile. (Fig. 2.42)

The first automobile, completed in 1897, became known as the Sutton Autocar after a feature was published in an English motoring journal on 13 January 1900.¹⁷⁰ Two versions of the Autocar were produced, the second improved model in 1898 – and they were described as a Doctor's phaeton, seating two.¹⁷¹ The now vertical engine was upgraded to 3½" bore X 4½" stroke and retained the 150lbs weight. It was rated at 8hp and continued to use a dry cell battery to provide ignition with a surface carburettor. Two-speed forward and one reverse speed was provided via a friction clutch and two chains to the front wheels. Steering by a tiller was on the rear wheels leading to the claim the Sutton car was the first front wheel drive car. It is a shallow claim given there was no differential or front steering. The time lag between the construction of the first Autocar in 1897 and its appearance in the English magazine three years later is explained by Sutton's drive to have the car working perfectly. This contrasts with the Austin Pioneer car of the same era that was rushed into the public domain with problems and experienced rapid failure.

Sutton said that he designed the engine to run on ordinary lighting oil (150° flash) and said it operated more efficiently on 730 (specific gravity) benzene. The benzene fuel did not require regular de-carbonising of the cylinder head. Another advantage with benzene was that as a painter's thinner it was available in all towns at seven pence per gallon rather than eight pence for the lighting oil.¹⁷²

Sutton's next car, a 2-seater built in Ballarat, appears to have been built in mid-1900 and was described by *Punch* as being a four-wheeled dog-cart: "It remains a four-wheeled dogcart exactly as when drawn by a horse, minus the shafts".¹⁷³

Steering was on the front wheels and the vehicle had three forward and a reverse speed with gearing to achieve 18mph. This appears to be a description of the Autocar in a revised form. *The Australian Cyclist* in

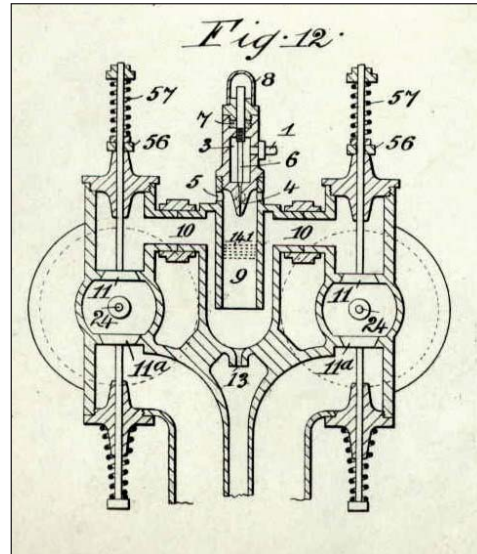
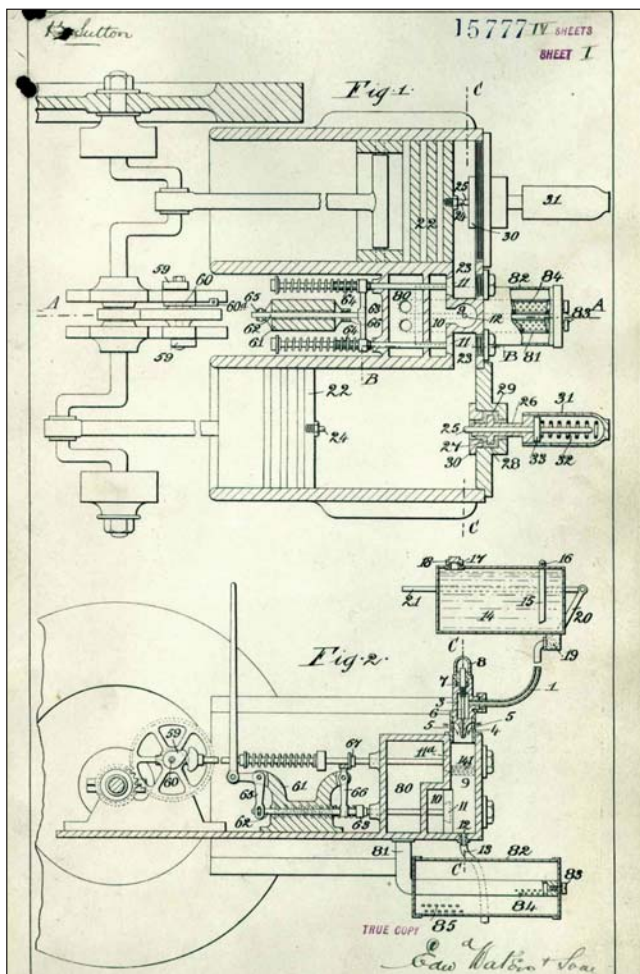


Fig. 2.41. Illustrations for Henry Sutton's patent, (no 15777) for the engine, vaporiser and exhaust layout dated December 1898.

NAA - Australian Patents office

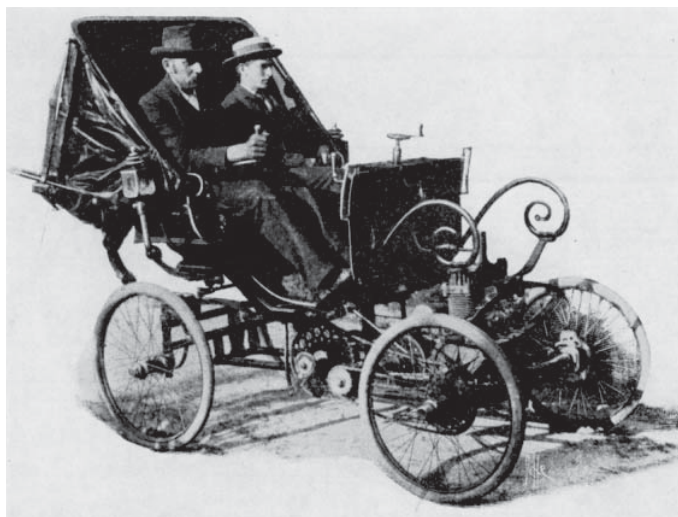
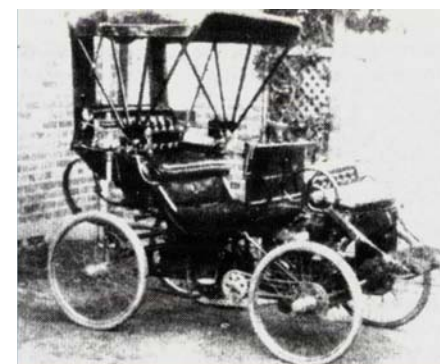
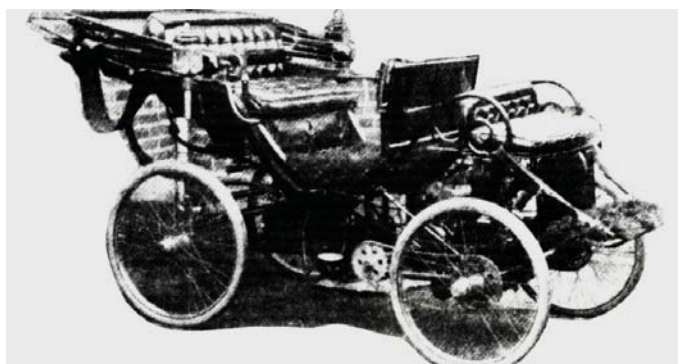


Fig. 2.42. Two versions of the first Sutton "Autocar". Above the first as a two seat vehicle and below a second with an additional seat over the front wheels.

Autocar Magazine (UK)

James Flood Book no 1



1902 published an image of a Sutton car with the name *Rancine*.¹⁷⁴ A high wheeled vehicle with pneumatic tyres and vertical steering wheel, it is clearly a steam car and not one produced by Sutton. *Punch* also discussed E Beauchamp's Motors work with Sutton's engine and carburettor, reporting that the next proposed vehicles to have a Sutton 8hp engine installed was a Lady's Victoria and a Doctor's Brougham, both using pneumatic tyres on ordinary wheels.¹⁷⁵ Beauchamp Motors in Prahran did a number of conversions using Sutton's engines or just carburettors.¹⁷⁶ A third design, also produced in Ballarat and based on the French *voiturette* style, was found in a Tasmanian motor museum by Sutton's great granddaughter, Lorayne Branch. Branch noticed that in an accompanying photograph Sutton and his first wife Elizabeth were sitting in the car.¹⁷⁷ (Fig. 2.43) The museum had information that the car came from Ballarat and that several had been made. The single cylinder engine is described as 3³/₈ bore X 3¹/₂ stroke and was originally fitted with a surface carburettor.¹⁷⁸ The vehicle described is in very good condition but does have obvious modifications, the biggest being the engine with its crude copper coil radiator, a cooling system that would not work. Sutton was working on a 2-cylinder engine yet this vehicle has a single cylinder, so the original engine was probably replaced. (Fig. 2.44)

The Ballarat *voiturette* car follows a pattern common to many European light cars. There is some resemblance in the chassis components to the Belgian Pieper, Delin, Vivinus, Pinart, and Prunel cars of the era. Specific components from P Boswell & Sons of London (front spring) and adjustable axle bearings (catalogue items used in many French & Belgian cars) indicate the chassis was assembled from components.¹⁷⁹ As Sutton was an inventor rather than a manufacturer I surmise that the car was based on existing designs except for the engine and fuel system that Sutton patented and developed.

Early photographs exist showing at least two different versions of the light *voiturette* 2-seater. The next car, a 4-seater, is said to have been put to the Austral Otis Engineering Company for production. The Gilltraps first suggested Austral Otis involvement.¹⁸⁰ Branch contends two prototypes were built, one being shipped to their head office in America, although nothing further has been found of this proposal and Branch has declined to provide evidence.¹⁸¹ By 1904 automobile chassis design had progressed rapidly leaving the *voiturette* style behind, which might explain why

Otis dropped production of this style and Sutton concentrating on his carburettor rather than the whole automobile. A search of the Otis company minute book for the period fails to reveal any mention of a car, albeit the minutes do show Otis was in serious financial difficulty suggesting a new project was not possible.¹⁸² We can only speculate the number of Sutton cars produced and by 1905 it was clear Sutton was no longer experimenting with automobiles.

The man responsible for Sutton's auto building was John Mennie, son of Scottish immigrants George and Ellen. Born in North Melbourne in 1864 Mennie became Sutton's mechanic, test driver, salesman, agent and perhaps manufacturer. When Sutton purchased the Beeston motor trike it was not Sutton who rode it to Ballarat or Warrnambool but Mennie. The Ballarat trip took 11½ hours owing to the poor condition of roads. On arrival at the Sutton store in Sturt Street in September 1897 Mennie was greeted with hundreds of onlookers who all clambered for a look at the motorised trike.

Mennie also went overseas for Sutton in March 1904 to demonstrate the Sutton carburettor at the St Louis World's Exhibition proving that kerosene oil was capable of running engines as perfectly as with petrol.¹⁸³ Mennie fitted the carburettor to a Fairbanks engine and coupled it to a form of dynamometer using a magneto rather than a battery to supply the ignition power. Sutton wrote: "Glad you adopted the magneto as that appeals to practical men, as against the battery".¹⁸⁴ Further correspondence between Sutton's brother and solicitor, Alfred Sutton, shows the Suttons expected to sell the atomiser (carburettor) in three sizes, for motor cycles at US\$1.25, up to 9hp at US\$2.50 and over 9hp at US\$5. The test was successful and patent rights were sold to Fairbanks but how many Sutton carburettors were made is unknown.¹⁸⁵

Also of interest is the 1903 electoral roll that indicates Mennie and his father were manufacturers in Moreland Road, Coburg. Were they making the Sutton Atomiser? Several were fitted to Melbourne motorists cars including one on a motor bike racer and one on Charles Mayman's hand built Beauchamp car in 1904. Arthur Sutton and Mayman both raced motor bikes and travelled together, until Mayman was tragically killed at a race in Bendigo in December 1904.¹⁸⁶ Mennie was also involved in motor racing, competing in the Dunlop 100-mile trial in 1905 in a 12-14hp Darracq. A Sutton carburettor survives in the hands of Mennie's grandson,

and it reveals the basic principles of a venturi and mixture adjustment making it an improvement over the surface carburettors of the day. (Fig. 2.45)

Victoria was not the only state where automobile experiments were taken place, South Australia too had inventors, among them was Vivian Lewis ran a successful cycle, motor cycle and automobile business in Adelaide from 1893. The Lewis Cycle and Motor Works, located in Freeman Street, Adelaide, built their first motor cycle, a triplet, in March 1899 and the first cycle-car ran in November 1900. A description of the Voiturette was recorded in *The Australian Cyclist* on 6 December 1900 that reveals rack and pinion steering, a powerful footbrake and a free-wheeling lever.¹⁸⁷ The 5hp petrol engine, reported to also have been made in the Lewis works was a first for South Australia. (Fig. 2.46) Over the next seven years the Lewis works produced at least six other cars with varying degrees of imported componentry, for example, the third car was known as a Lewis-Aster.

The man responsible for the design and execution of the Lewis car was works manager, Thomas P O'Grady. According to his son, O'Grady took an interest in powered vehicles and in 1897 fitted an air-cooled 2hp engine but by March 1901 at the Royal Agricultural Show the 5hp engine was in place. *The Register* described the motor carriage as:

This year the speciality is a motor carriage and a motor bicycle, the whole of the designing, construction, and finishing of these machines being executed at the works. The former of these is a smart looking buggy of the Marni type, capable of carrying three persons comfortably, mounted on tangent suspension wheels, shod with pneumatic tires, which in conjunction with the regulation vehicle springs make it a very comfortable carriage.¹⁸⁸

The Lewis Project has determined the first engine was kerosene powered with a hot-tube ignition and the second 5hp unit ran on petrol with an electric ignition. A top speed of 14mph was recorded with the 2hp engine and this increased to nearly 20mph once the larger engine was fitted. The larger water cooled engine required a bigger engine bay but the size of the bonnet suggests the engine was a single cylinder. A second car was completed towards the end of 1902 and featured 8.5hp engine.¹⁸⁹ (Fig. 2.47)

George Brooks attempted to document the Lewis cars, recording nine over the period 1900-1907.¹⁹⁰ Interviews with O'Grady in *The Critic* suggest only



Fig. 2.43 Sutton's third car found in Tasmania. Has been modified over time.

N Darwin

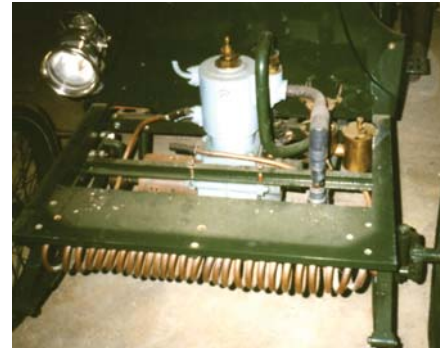


Fig. 2.44 Detail of car three engine transmission.

B Sides

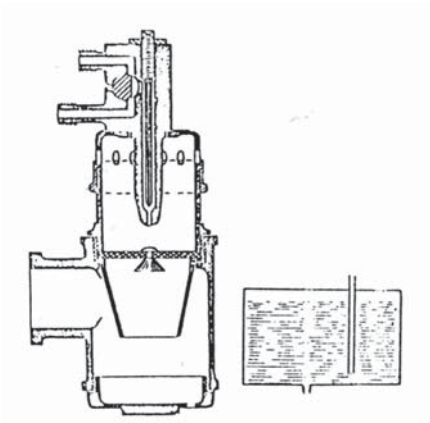


Fig. 2.45. Left and above. Sketch, drawing and notes by Henry Sutton describing his carburettor.

the first two were built in the Lewis works, the rest were assembled using Heron-Astor components from the Heron Motor Company (Birmingham) works. (Figs. 2.48 & 2.49) The third car is recorded as having a De Dion-Bouton 8hp engine and the eighth, using a 12/14hp Aster engine was sold to David Shearer of Mannum. O'Grady made a bold statement in 1908: "The general construction of the engine has been brought to a state of perfection that little room is left for improvement".¹⁹¹

A design source

Records show that several people were building cars using specifications and drawings from overseas magazines. A well-publicised series titled "A small motor-car and how to build it" appeared in the English journal, *The Scientific Mechanic and World of Science*, over several issues. The car was designed by Hyler White and the English firm, D J Smith & Co, were able to offer a kit of castings and components through E M Cars. E M cars shipped the components to purchases in the colonies.¹⁹² F A Taylor used the magazine's series of articles to produce his version in Wollongong, New South Wales, in 1906. This vehicle was later purchased by Graeme Hoskin and recorded in the *VCCA (Vic) Brass Notes* magazine in 1986. A second vehicle was produced in Bombala, New South Wales, at the same time by William Way with a third steam powered version built in Broken Hill.¹⁹³ (see appendix I).

As 1908 dawned all thought of building motor cars was forgotten, since money was to be made in importing and selling, the principal suppliers being United Kingdom, France, Germany, United States, Belgium and Italy. In 1906 the value of imported automobile cars and parts was; United Kingdom £95,233, France £46,627, Germany £9,161 and America £7,776 and from a British perspective more imports from the home country were required. A survey of Australian trade in 1907 by Benjamin Morgan suggested Australian conditions required manufacturers to provide some special features in their design as there were a few bridges and streams needing to be forded. Morgan listed the areas of concern; track, clearance, wheel-base, carburation, steering lock, fuel supply, lubrication, tyres, springs, radiators, ignition, gearing and bodies: "A few cars have been built, or partly built, locally, but there is little prospect for some years of any serious manufacturing being done".¹⁹⁴ Morgan's some years turned out to be 40.



Fig. 2.46 Vivian Lewis, at the wheel, and Tom O'Grady, seated in the car with the first Lewis car and workers from the Lewis workshops.

Mortlock Library

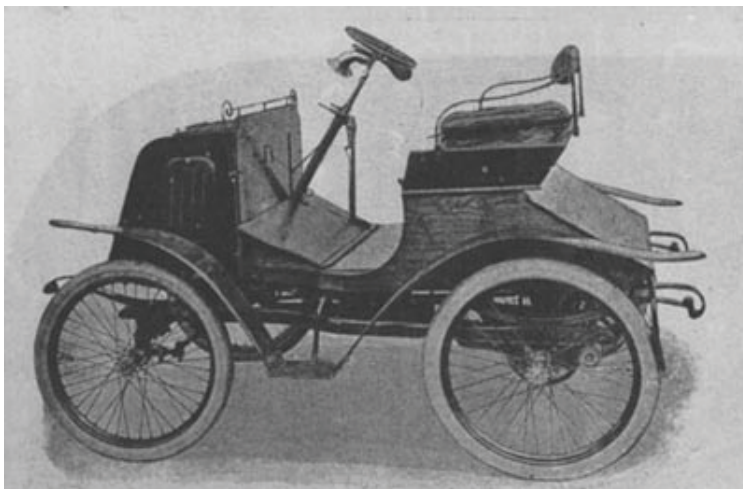
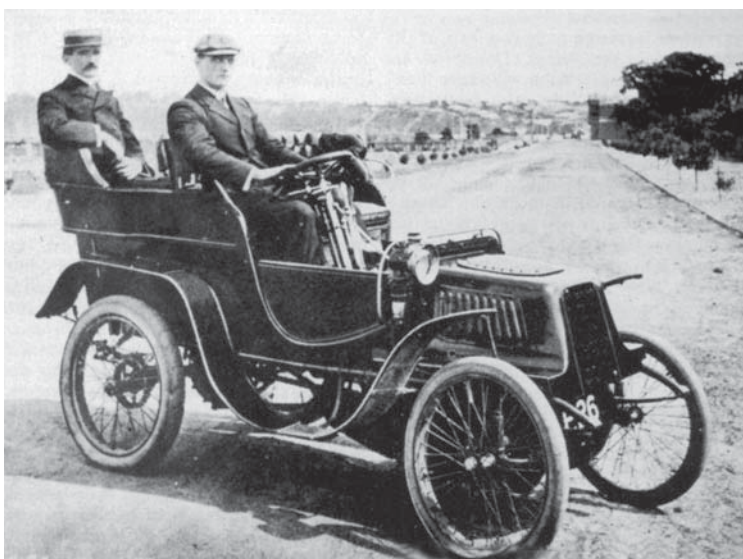


Fig. 2.47. In 1902 the engine of this first Lewis car was upgraded to 6hp and the car used to ferry despatches between a court house and a telegraph station, a distance of 30 ks. This was an attempt by The Advertiser to get reporter's copy from a murder trial delivered first.

Adelaide Advertiser



BICYCLES.
Still a First-class Assortment and at Right Prices. All Necessary Accessories Stocked. Repairs.

MOTOR CYCLES.
2 1/2 H.P. air and water-cooled, magneto ignition; latest types; easiest to handle; absolutely reliable.

MOTOR CARS.
New shipments regularly. Talbot, Minerva, Genuine De Dion; direct from head works. Lewis Cars, with Tonneau or side-entry bodies, Aster or De Dion Engines, one, two, or four cylinders.

BEST EQUIPPED WORKSHOPS IN AUSTRALIA.
Repairs prompt and reliable.

Lewis Cycle Works, Gawler-pl.
The Motor House, Victoria-sq.,
And at BROKEN HILL and KADINA. 6c

Fig. 2.48. Advert for Lewis showing a Lewis car could have either a De Dion-Bouton or Aster engine.

Advertiser 1 Jan 1906

Fig. 2.49. Left. Single cylinder 8hp Lewis car c1906.

Sporting Car Club of SA

Other significant technological design developments

A number of other individuals attempted to produce automobiles between 1895-1915. These are documented in Appendix II. Several worked on specific aspects of auto design, Grummett (1905) patented a swing seat for the Rotund style body (see Chapter 3), the Caldwell brothers (1907) developed a 4-wheel steer and drive system and George Hoskin developed a viable front wheel drive system.

Caldwell Brothers

The youngest of eight brothers, Norman Caldwell (1882-1963) and Felix Caldwell (1879-1966) were born in Woodside, South Australia, sons of Adelaide politician and poet, Robert Caldwell. Felix Caldwell is said to have designed and made a 10hp engine and 4-wheel drive transmission system that was patented in 1907 as a 4-wheel drive and steer tractor under the title, (no. 9493) *Improvements in and connected with Driving and Steering Motor Propelled Vehicles*.¹⁹⁵ (Fig. 2.50)

The patent is in the name of both brothers and while Pedr Davis asserts that Felix was the designer, Jim Longworth states Norman came up with the idea, and Felix, with his mechanical engineering training, put it into practical use. Felix Caldwell trained at the Gawler School of Mines, studying mechanical engineering, advanced mechanical drawing and advanced mechanical design. The design has been claimed to be the “World’s Best Tractor” for its era.¹⁹⁶

The first demonstration of Caldwell’s tractor was at the Roseworthy Agricultural College on 8 March 1909 where onlookers saw a 6-ton machine powered by a twin cylinder engine mounted in a chassis measuring six metres and fitted with 10-furrow plough.¹⁹⁷ The success of this ungainly motor plough led the brothers to seek finance to proceed into production. Henry Vale, an industrialist who recognised the machine’s potential, funded the Caldwell-Vale Motor & Tractor Construction Company Ltd in Auburn, New South Wales, in 1910.¹⁹⁸ Vale was apprenticed to his father’s English locomotive factory and emigrated to establish Vale & Lacy in Sydney in 1865, building locomotive steam engines for New South Wales railways. He later established Henry Vale & Sons Iron Works in Auburn and it was here he annexed a corner of the factory to establish the Caldwell-Vale works.¹⁹⁹

In 1913 the brothers produced a light version of the 4-wheel drive and steer system for a touring motor car, demonstrating successfully in the sand hills near Botany. (Fig. 2.51) This same year the company fell victim to a civil suit over the failure of one of the road tractors drive systems. Insufficient capital saw the company fail after the loss of the law suit. The company assets were purchased by T Purcell & Co of Auburn who continued to build 4-wheel drive trucks until the 1920s.²⁰⁰ In 1921 Purcell was reorganised into Purcell Engineering Co Ltd that produced machine tools, locomotives, rolling stock and stationary engines.

Despite Caldwell's drive and steering system receiving high praise and achieving newsworthy feats, by 1930 it was forgotten. Apart from brief mentions by Gilltrap, Davis, Paynting and Johnston the Caldwell-Vale vehicle history remained obscure until Simon Jackson raised the design's importance in his doctoral thesis of 2006.²⁰¹ In 2013, a paper presented to the Engineers 17th Heritage Conference by Jim Longworth

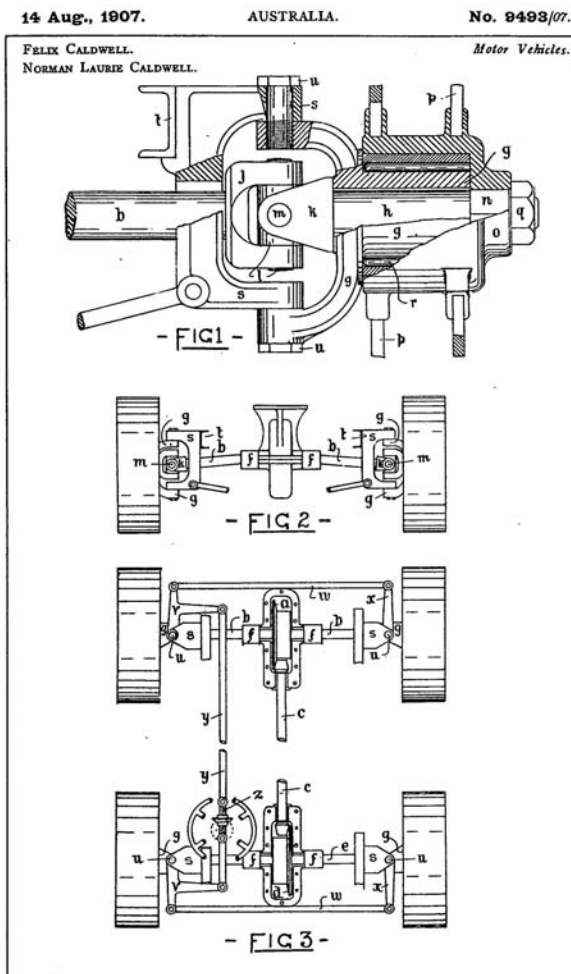


Fig.2.51 The 4WD Caldwell-Vale car.

P Davis

Fig. 2.50. Left. The Caldwell four wheel drive and steering patent.

NAA - Australian Patents Office

reminded participants of the Caldwell's importance, stating: "Engineering inventiveness and business success are not necessarily linked".²⁰²

Longworth draws several conclusions as to why the Caldwell-Vale system failed. He cites the use of fabricated frames with bolts that were shaken apart and distorted, sub-optimal metallurgy in castings, miniscule product runs, every vehicle was unique, a lack of field technical expertise that led to poor maintenance, as well as insufficient product pre-sale testing. (See appendix I for further detail on the Caldwell-Vale design)

George Hoskins front wheel drive system

A second Australian front wheel drive designer, George Hoskins one of the country's pioneer iron and steel producers who joined with his brother, Charles Hoskins to establish an engineering workshop in Hay street, Ultimo in 1875.²⁰³ The brothers went on to establish G & C Hoskins Ltd in Lithgow, producing both sheet and bar steel stock from their own furnace. George attended to the practical side of the business and Charles the finance and management. The brothers had been inventing and patenting labour saving machinery since 1903 and in the years 1910-1916 Hoskins submitted 11 patent applications. (Fig. 2.52)

George Hoskins was born in London but emigrated to Melbourne as a lad, taking an apprenticeship with mining engineers, Messrs James Martin and Co of Ballarat in 1863. Hoskins then joined the Surface Hill Gold Mining Co in Smythesdale as a mining engineer and in 1872 worked with Messrs A Roberts and Sons in Bendigo.²⁰⁴

In his retirement Hoskins began to think about the problem of rear drive cars skidding: "Whilst touring England (in 1906) we very often escaped disaster through our car skidding on slippery roads".²⁰⁵ The result of his investigation led Hoskins to patent a: "...tooth-gear system where the power is, or can be, equally exerted on both sides of the centre of axis, the teeth having contact from end to end".²⁰⁶

Hoskins fitted a prototype front wheel drive system to a Standard car in 1915 and suggested it could be fitted to any vehicle.²⁰⁷ While the Hoskins's front wheel drive system was innovative in its use of specifically machined gears, it would have been expensive to manufacture and the market for

such a system was non-existent in Australia. A modified version was taken up and developed successfully in America by Gary Hoskins of Hoskins Products, for large industrial applications.

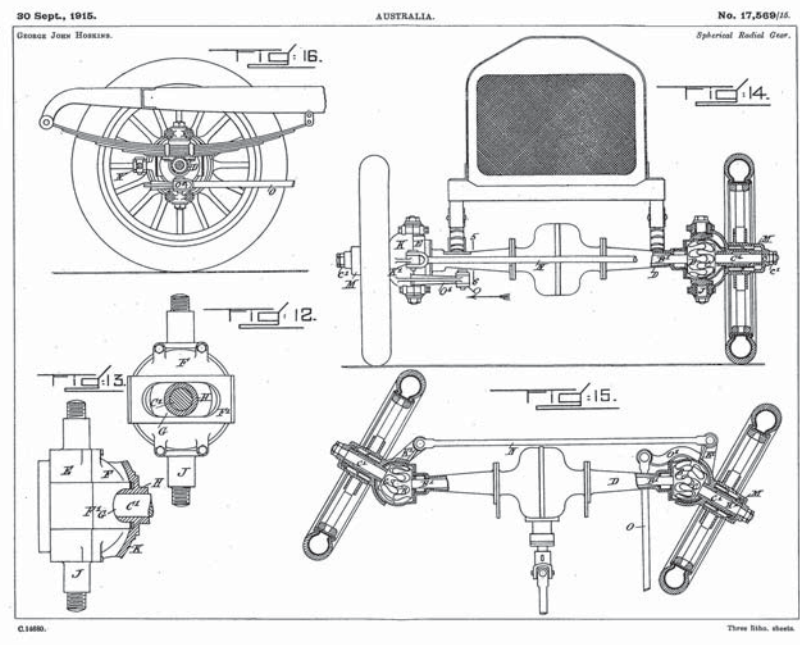
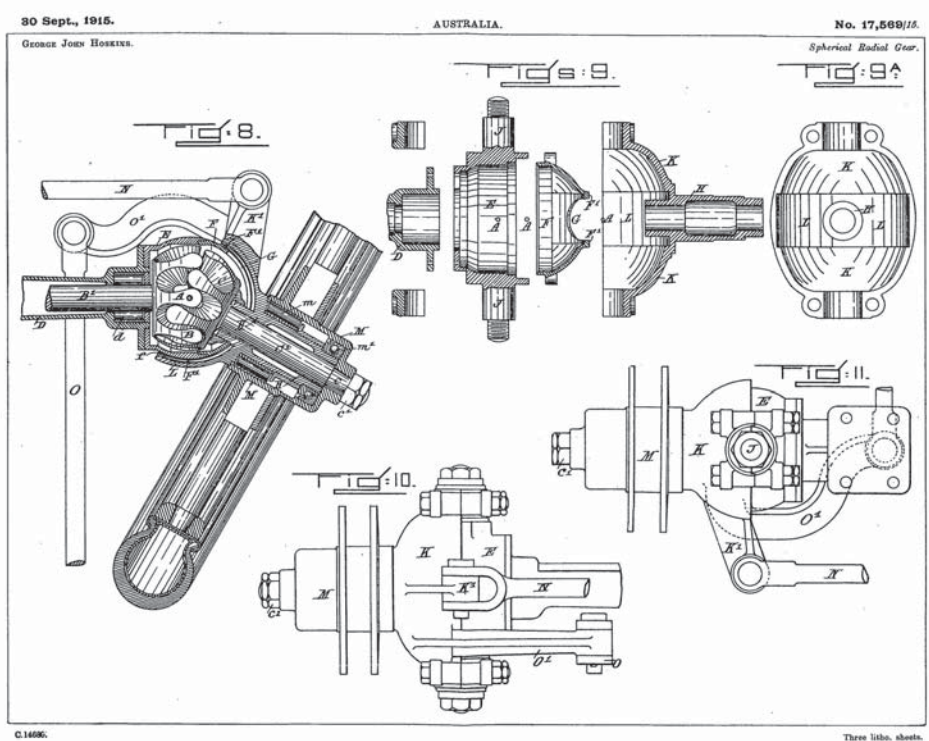


Fig. 2.52. Hoskins patent drawings.
 NAA - Australian Patents Office

Summary

European car design developed for almost ten years before Australians, mainly inventors and copyists took up designing and building automobiles. In Victoria however six designers emerged before 1900, all produced patent applications that showed design intent.

This small group began to make a contribution in specific areas of automobile design, Thomson, Tarrant, Austin, Certain and Pender (motors & mechanisms), Sutton (carburettor with a venturi), Caldwell (4-wheel drive and steering system) and Hoskings (Front wheel drive system). These designers, as defined, are Australia's first Automotive designers.

Few made a lasting contribution, due to the rapid change in technology and or a lack of finance. Improved metallurgy possibly made Pender's transmission obsolete, new overseas technologies made Thomson and Tarrant's cars expensive, petrol killed off the use of kerosene and with it Sutton's carburettor, a law suit stopped Caldwell's idea. As cheaper imported automobiles flooded into Australia the novelty of acquiring your own vehicle by building it yourself disappeared. It is unknown why Certain's engine and transmission did not proceed, also the reasons for Austin's early demise. Only Hoskings made a lasting contribution to automotive design. The emergence of Australia's automotive designers pre-1900 establishes a design history to the current period and can be traced by mapping the events, roles and stages of automobile development. The following Map of Australian Automobile Design reflects the known history.

This chapter has reviewed the design and manufacture of complete automobiles, the next chapter investigates the complementary motor body industry and the emergence of motor body designers.

An evolution and map of Australian automotive design

This thesis sets out to document the history of Australian automotive design and while the second chapter has explored the early inventors and tinkers, real automotive design, in an Australian context, did not begin to be revealed until after 1917. The evolution commences in 1895 when coachbuilders began producing bodies for the first motor car chassis. Their coach building craft enabled them to apply learned skills, a sketch on paper, a full size chalk drawing on the floor and finally a motor body. As technology drove the mechanical design the coachbuilder adapted, learnt new skills, steel replaced wood, the motor body builder emerged and started an evolution that led to the current automobile designer. Mapping the role of the Australian automotive designer can be defined in four distinct stages. (Fig. 2.53)

Today designers are required to create an automobile commencing with a graphic or industrial designer sketching a concept, creating a CAD file, a packing engineer ensuring components will fit the available space, technicians building models, bucks and full size mock-ups, automotive body engineers and finite analysts ensuring the weight, cost, integrity are manufacturable - a team of highly skilled designers. In 1905, one man, the body builder, was responsible for the looks, the structure and manufacturer of an automobile.

Stage I. 1895-1916

As the automobile replaced the coach, the body builder replaced the coachbuilder, initially using the same skills. When new materials (steel and aluminium) were introduced the role evolved into a body designer. Training was vocational, on-site skill based apprenticeships with a theory and practical technical educational component.

Stage II. 1917-1930

Body design was no longer a crafts based trade with apprenticeship training, as metal bodies were being shaped by machinery, presses and forming rollers and accuracy became significant, precise drafting was essential, training was both on-site and at selected technical institutions. The period saw trained engineers move into the designer role.

Stage III. 1931-1969

As automobiles became more powerful and larger, university trained engineers were required. The body engineer now oversaw the roles of body designer, draftsman and a new profession, the art based stylist, who initially selected colour and trim materials, then evolved to sketching and drawing the external and internal aesthetic form of the motor body.

Stage IV. 1970-2000

Today the Australian automotive designer is a specialist with the combined skills of a body structure analyst, artist and engineer who can not only visualize the final form but recognise the structural elements required to make it function, all within a computer aided environment.

Fig. 2.53. Evolution map of Australian automotive design

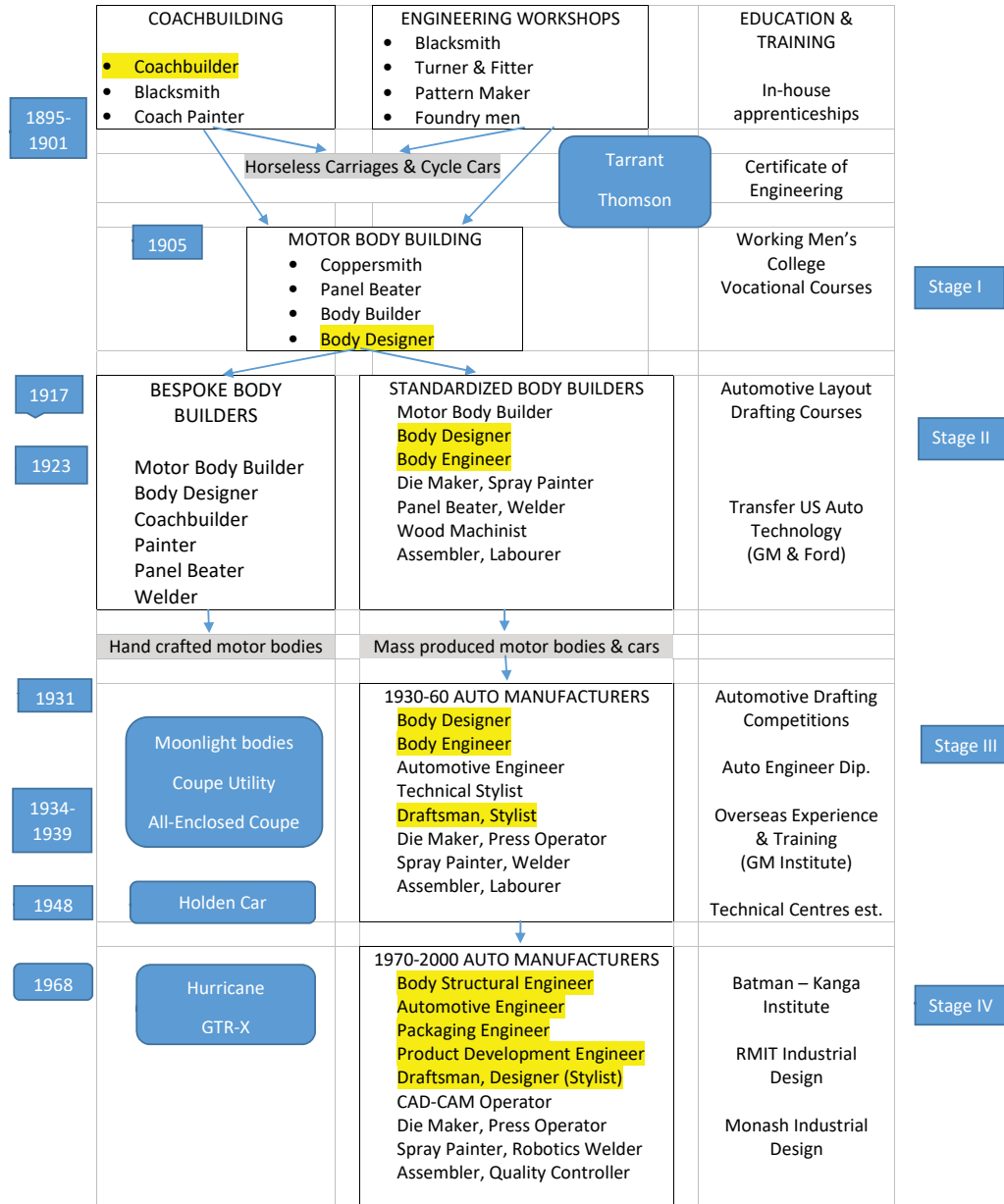


Table 2.1 Tarrant Production

Pre-production 1895-1897

1. A 2-cylinder cycle car was produced that in Tarrant's words "never really got on the roads". Chain drive, rear engine.

First series 1900-1902

2. Rear entrance Tonneau with front Benz engine. Sold to W H Chandler 1901.
3. Rear entrance Tonneau front engine 2-cylinder Tarrant, revised radiator mounting and multi-louvered bonnet.

Second series 1903-1905

4. Rear entrance Tonneau front 2-cylinder Tarrant 8hp engine, vertical (chamfered) radiator. Sold to F S Grimwade in 1904.
5. Rear entrance Tonneau, solid tyres, 2-cylinder Tarrant 8hp engine sold to Leslie McPherson in 1904.
6. Two seater 2-cylinder Tarrant 10hp engine used by Harley Tarrant to win motor race at Sandown Park in March 1904.

Third series 1905-1907

7. Unknown body. Chassis fitted with a 3-cylinder White & Poppe marine engine that was adapted to the Tarrant 4-cylinder chassis. Sold to A H Bell, Dentist of Collins St, Melbourne in 1905.
8. Unknown body. Chassis fitted with a 3-cylinder White & Poppe marine engine that was adapted to the Tarrant 4-cylinder chassis. Sold to Moreland Metal Company, Moreland in 1905.
9. Brougham body built by Dan White on 20hp 4-cylinder Tarrant chassis sold to Jack Wallace in June 1905.
10. Van built on a 2-cylinder Tarrant engine chassis for F S Grimwade c1906.
11. Two seater, 4-cylinder Tarrant engined car built for Russell Grimwade, class winner of the 1906 Dunlop Reliability Trial.
12. Two seater 2-cylinder Tarrant engined car that Harley Tarrant used to win his class in the 1906 Dunlop Reliability Trial.
13. Van built on a 2-cylinder Tarrant chassis for the Melbourne Herald Newspaper in 1907.
14. Two seater 4-cylinder Tarrant, possibly the car now owned by the RACV.

Sources: D Holmes notes on various publications re Harley Tarrant. RACV 320 Box 2 Series 2 Folder 35
Notes by Archie Tarrant-Weir H Tarrant Archive RACV 320 Box 2 Series 2 Folder 36.
Coachbuilder & Wheelwright June 15, 1905.

Note: This list is based on several sources within the Tarrant archive, which has gaps that will account for missing cars, estimated to be one or two.

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Chapter 3: Early development of automotive body design

Chapter three traces the early formation of the Australian body building industry, an industry that would grow to become the majority of Australia's automotive manufacturing sector until the release of the 48-215 Holden in 1948. I will argue that the early body builders, the craftsmen who emerged from the horse drawn carriage industry, were Australia's first automobile body designers. Their artistic skill was encouraged by talented educators who first saw form and function equally.

Motor body building: The beginning of an industry

The Australian automotive industry's roots are firmly grounded in the coach building trade, a trade that dates to 1849 in Melbourne when there were three coach builders operating. These were Heales & Carter, Liddy & Passfield and James Rolleston.¹ When automobile designers, Tarrant, Thomson, Ridge and Lewis sought a suitable structure to carry the driver and passengers in their fledgling automobiles, they looked to the existing coach trade, Tarrant to Alex Smith at the Clifton Hill Waggon & Wheelworks (1900), Thomson to Martin & King (1896), Lewis to Duncan & Fraser (1899) and Ridge to the Jackson's Carriage Works (1897). The resulting vehicles were simple horseless-carriages. This early period of automobile development, pre-1900, was viewed by the coach trade as a novelty, yet by 1896 *The Australasian Coach builder and Saddler* wrote:

Considering what has been done, as the starting point of the evolution of the horseless vehicle it is not difficult to imagine serviceable vehicles of the kind in general use in most civilised countries before the coming century is out of its teens.²

The first motor body designers were coach builders, craftsman who worked with wood and canvas to produce all manner of buggies, coaches, and carts. Even relatively small businesses saw design being practiced. Perhaps Australia's earliest motor body builder was Alexander Smith who had commenced as an apprentice coach builder with Jackson's Carriage Works in c1894. By 1903 Smith had his own business and in 1907, following a takeover by Tarrant, became works manager, eventually gaining the position of consulting draftsman in 1923.³ Men like Smith and Frederick

White, foreman in Arthur Denton's body shop in Launceston, Tasmania, were by default the body designers and their experience and skill was used to create a style acceptable to the customer. That they excelled in their trade is evidenced by White's gold medal, awarded at the motor and car builder's convention for his design drawing. White was also an instructor at the Launceston Technical School.⁴ In New South Wales the firm of H A Sweeny at Summer Hill from around 1909 employed a special draftsman to reproduce clients' ideas in every detail as well as create general body designs.⁵

If any planning was done it was usually sketched out in chalk on the factory floor. This then evolved into *Coach Builder's Art*, a book of plans, artwork and sketches of ideas and designs. A prospective customer would peruse the book and following discussions with the coach builder, make his own changes to suit individual needs.⁶

An *Atlas of scale drawings of popular Australian vehicles*, comprising various coach and buggy plans, was published in three series by J E Bishop & Co from 1896. In 1902 a *Book of Designs* was published, this was updated in 1909 with a section on motor car bodies.⁷

A flow of English and Scottish tradesmen ensured the latest design trends and developments were quickly adopted. The Hansom Cab arrived in Melbourne in 1849 following the arrival of an English coach builder, on applying for a job he was asked could he make a Hansom Cab, yes, he could and went to work.⁸

The Australian body building industry, while slow to start, saw a number of progressive individuals begin to produce motor bodies. Men like T J Richards, R A Duncan, D White, A E Cutter were quick to see the automobile's potential. By 1908 several firms were wholly engaged in motor body building. Perhaps the first was Melbourne Motor Body Builders, established in 1907 when Harley Tarrant purchased Alex Smith's business. James Flood followed in the same year and E Nowlands (Sydney) in 1908. Robert Duncan built his first motor body in 1904 stating: "This body closely followed the design of a horse-drawn vehicle, and was indeed very crude, as compared with the body we know today, as its chassis was equally crude".⁹

In a paper presented to the 1909 Carriage and Wagon Builders' convention, Duncan warned that the motor car posed a threat to the coach trade.

The motor car, he thought, was a serious rival: “Where were the Landau, Brougham or Victoria coach styles?”, he asked. Duncan forecast that motor traders would make bodies for their imported chassis. Summing up, he called for his peers to grasp the opportunity and to add a motor department to their present business, surmising they would have been better placed if they had taken up making safety bicycles when they became popular in the 1880s: “They would have had a better grip on the trade”.¹⁰

Charles Ibbotson was one coach builder who took heed of Duncan. Ibbotson’s firm was established in Newtown, New South Wales, in 1881 as the Central Coach Factory. His sons, Harold, Charles and Stanley joined the firm, Harold holding the position of motor body builder from 1912 and by 1918 the firm was known as Ibbotson’s Coach and Motor Body Works.¹¹

It was noted in 1907 by the *Referee* newspaper that the introduction of motor cars had saved: “...the practically moribund coach-building industry”, developing it into one which was flourishing. The *Referee* also reported that in addition to providing employment to thousands in coach building firms, the industry had stimulated the steel trade, the rubber industry and the electrical industry.¹² Was this grandiose thinking, “thousands” of employees? J Phizackerley, a Sydney motoring pioneer, wrote that there were about 25 automobiles in New South Wales in 1902, but now, in May 1908, there were 80-90 different makes of vehicles. Phizackerley estimated that “there must now be fully 1,000 men engaged directly and indirectly”, just in New South Wales. Already it was noted that nearly all hoods, tyres and glass screens were of local production.¹³

Within two years those coach builders who failed to heed Duncan’s advice were seeing the downturn in their industry. The 1911 Sydney Coach & Wagon displays at the Royal Easter Show were missing both builders and vehicles. The Landau, Barouche and Brougham coaches it was reported were eclipsed by the motor car.¹⁴ J W Waring, a Melbourne coach builder, suggested they need not worry about motor cars, which he said were like ladies’ hats, they were changing every year. Waring eventually turned his coach business into producing bespoke motor bodies, particularly sporting types.¹⁵

Duncan’s warning that motor agents would establish their own body building departments became apparent by 1910. In early 1909 the Kellow Motor Company opened a large showroom, workshop and body shop and

was reported to be entering a branch of the business (body building) in earnest: “Some excellent specimens of the body builder’s art have been turned out recently from this establishment”.¹⁶ (Figs. 3.1 & 3.2) Dalgety & Company had quickly established agencies for a number of makes including Austin, Daimler, Standard and Delaunay-Belleville in four states.¹⁷ By October 1910 they were advertising: “Best Quality Colonial & English bodies of distinctive types”.¹⁸ In 1912 Dalgety & Company Ltd built a new three storey showroom, garage and body works at 654-664 Bourke Street, Melbourne.¹⁹ Phizackerley also established a motor body building shop as part of his motor showrooms in central Sydney, and in 1909 moved to larger premises in Randwick.²⁰

The 1911 Sydney Royal Show report noted that generally local body builders were producing designs with:

Highly creditable bodies. But compared to the best imported bodies they have a lot to learn in the matter of detail design and finish. Specifically, the placement of hood sticks making it difficult to enter and leave the car, bumpy and hollow panels, badly fitting doors and lack of proper leg and seat room were noticed. All of which requires a little more experience to obviate in the future.²¹

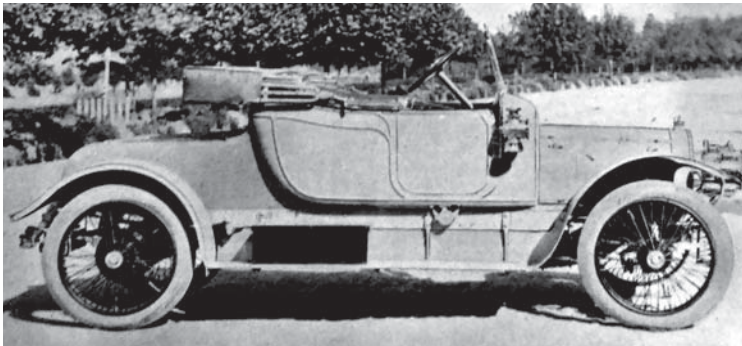


Fig. 3.1
1912 Roadster body by Dalgety & Co Melbourne. Shows clean straight lines with decorative mouldings providing “form”. The rear boot area is purely functional.
The Coachbuilder and Wheelwright, Jan 1913, 285

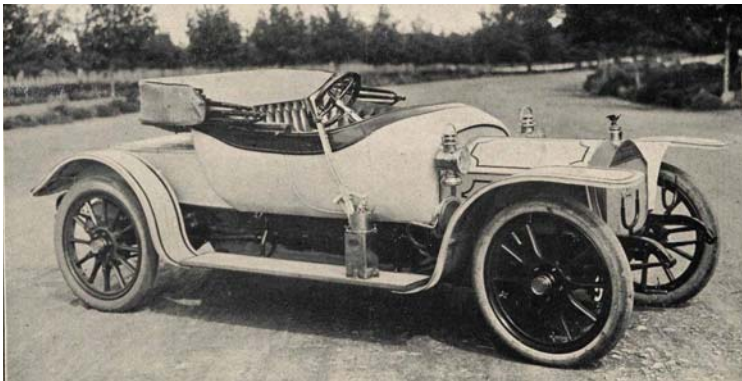


Fig. 3.2
1912 body by Thomson Bros Windsor Vic. fitted to a Martini chassis. Compared to the Dalgety body above this body has a stylish decorative moulding with contrasting paint.
The Australasian Coachbuilder & Wheelwright, Jan 1912, 305

Early body styling

In 1937 E Beaumont a body engineer at Vauxhall wrote:

It is apparent that the first car bodies were incidental to the final effort, and just 'happened', being a means for keeping the elements away from the occupants. They were built by anybody who was handy and unoccupied.²²

This observation was perhaps unfair to the many coach builders who produced early automobile bodies. It is true that early motor bodies shape and finish was of little importance yet it was argued by Edward Carlton, instructor of coach building at the Working Men's College that master coach builders did their best to give vehicles pleasing proportions. He said this was due mainly to the fact we are all rather inclined to take the visible portion for the whole of the article.²³ Here is evidence that the motor body builders were considering form as well as function. In early 1904 *The Australasian Coach & Wheelwright* published their first motor body design, the Stanhope, a 4-seater constructed from wood with an engine under the front seat.²⁴ (Fig. 3.3) The Stanhope, a purely functional design, was based on the Stanhope buggy, first seen in the United Kingdom from the beginning of the 19th century. The design can be seen in Thomson's steam car of 1901. (Fig. 3.4)

An advantage for early automobile body designers was that the only precedent they had was a coach which explains why early closed vehicles look like coaches. Still, by 1910 the automobile was taking on style ahead of form. This was made possible through engineering developments; moving engine to the front, development of the radiator as a means of identity, steering wheels over tillers, Ackerman steering, introduction of prop shafts to eliminate chains, moving the scuttle (firewall) forward relative to driver and development of motor car wheels (smaller diameter).

The first step to a specific automobile body occurred about 1897 with the introduction of the hind tonneau body in France with its space for three additional persons.²⁵ It is claimed to be the first body made specifically for the automobile.²⁶ The version built by Daniel White in 1904 and illustrated in detail, the first time an Australian automobile had been drawn in a graphic style, was built on a chassis designed by White who also held agencies for Wells, Syme and Duyer cars.²⁷ (Fig. 3.5) White's car shows a

strong resemblance to the De Dion-Bouton cars arriving in Australia in the same period. The body was functional with no embellishments.

The tonneau was refined in 1901 reportedly by the King of Belgium's mistress in consultation with the French coach builder, J J Rothschild & Sons. The resulting design, still with a rear entrance, was known as the Roi de Belges style.²⁸ Builders of expensive motor bodies adopted the Roi de Belges style, sometimes referred to as a tulip body. In 1905 the side-entrance tonneau appeared, made possible by extending the chassis and eliminating the chain drive, allowing side entrance to the rear seats. Cheaper bodies had straight sides and less opulent seat upholstery, and these later became known as a tourer or phaeton or the rotund, which was a modified Roi de Belges style where the separate seats were combined. Adding a roof for the passengers created a Limousine or Brougham, or if it folded down, a Landaulet.²⁹ (Fig. 3.6)

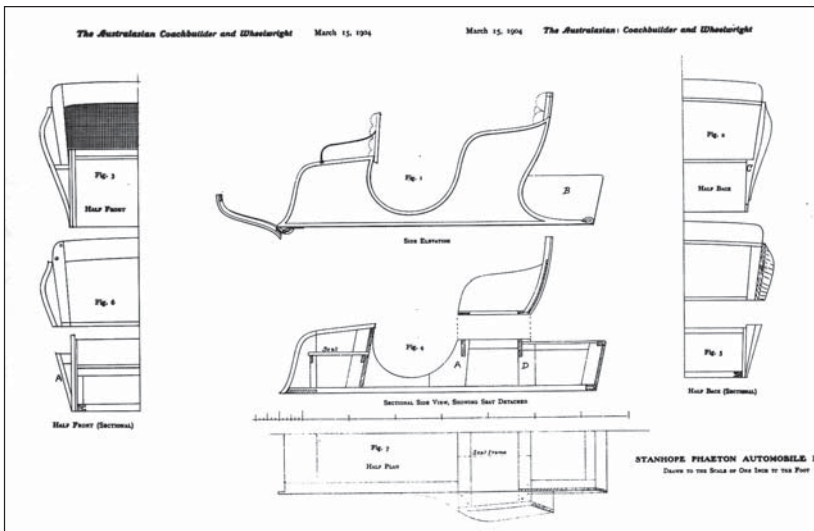


Fig. 3.3. Left. The Stanhope body designed by the Bishop Brothers in 1904 to seat four passengers and driver.

Fig. 3.4 Above. Thomson's body followed the "Stanhope" style.

The Australasian Coachbuilder and Wheelwright, March 1904

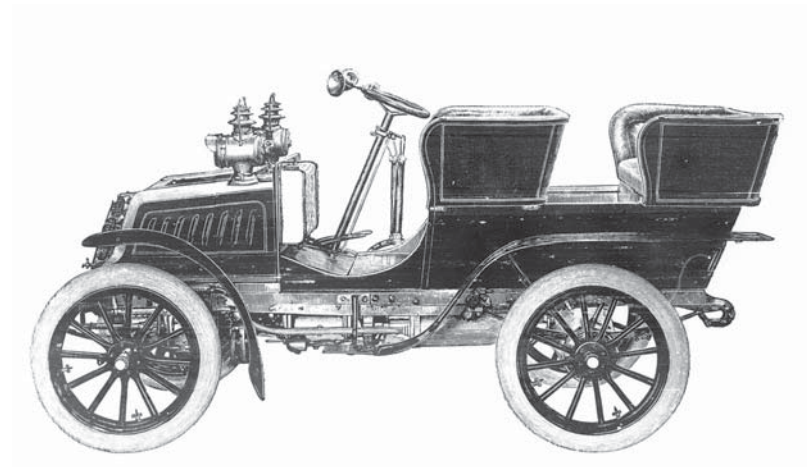


Fig. 3.5

Graphic of the Dan White 8 hp Tonneau shows strong resemblance to the 8hp 1904 De Dion-Bouton except the body has an open side at the rear. White imported the chassis.

The Australasian Coachbuilder & Wheelwright, 1905, Jan, Suppl

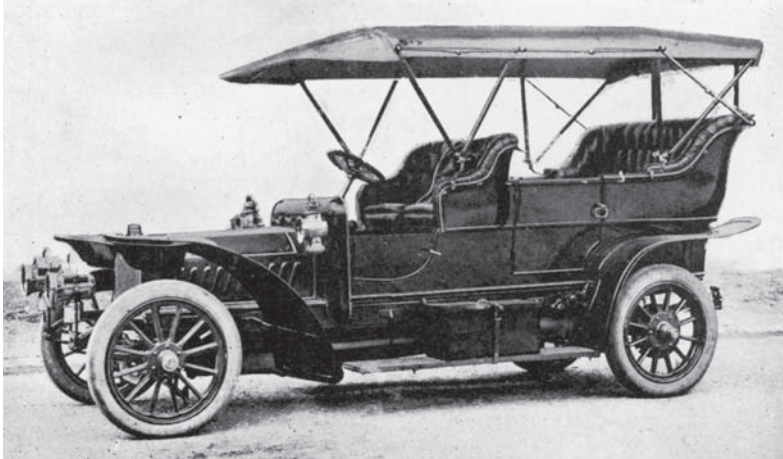


Fig. 3.6
Side entrance Roi de Belges
body produced in 1907 by Dan
White for the Shields Motor
Company on a Brown Bros.
22hp chassis. White used
Sankey seat pressings.

**The Australasian Coachbuilder &
Wheelwright, Nov 1907, 213**

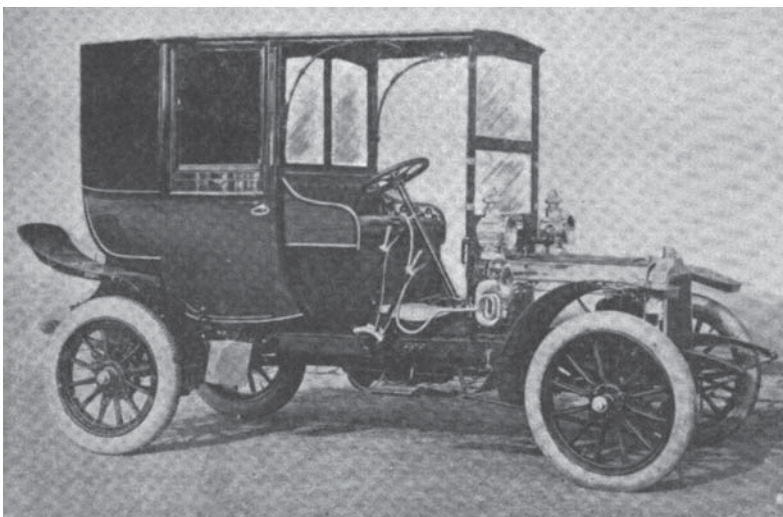


Fig. 3.7
High class Brougham body
built by the Ewing Bros.
Melbourne on a Clement-
Talbot chassis. In keeping with
imported high class bodies
the vehicle had silver plated
fittings and Royal Blue paint
with Orange pinstriping.

**The Australasian Coachbuilder &
Wheelwright, July 1907, 101**

From 1902 expensive cars were fitted with plate glass windscreens attached to a dash-board, a coach term for the part that protected passengers from mud and dirt thrown up by horses. Bodies on high-class chassis also used coach body terms, Brougham, Cabriolet and Limousine Landaulet. (Fig. 3.7) The seemingly stop-start between the bonnet and the body at the dashboard was eliminated in 1908, when a scuttle was added by moving the dashboard rearward and creating a space so that the bonnet could be blended into the body. The name scuttle came from coal scuttle as this is what the initial shape looked like. It is now called a cowl.

Carlton, the first motor body building instructor was proud of his former students who were: “holding some of the best positions in the motor-body building industry in the State, and are in constant demand”.³⁰ One student was Horatius (Harry) Paul.³¹ Paul had been employed by Tarrant to establish the Melbourne Motor Body Works in 1907, which he achieved

by purchasing Alex Smith's business and employing Smith as his head foreman. Paul and his brother, Ewart Paul, were both Tarrant employees, Ewart working as the company secretary.³² Paul also sat on the Working Men's College Advisory Board.³³

In 1909 Paul advised that the Melbourne Motor Body Works were introducing a new style, the rotund, at the expense of the Roi de Belges body that Paul said was no longer popular. It is believed the Roi de Belges style was: "more graceful of what types of panel [meaning the overall body shape] there are to choose from at present". (Fig. 3.8) The rotund he explained was very roomy and much lower. (Fig. 3.9) The term rotund was not in general use, elsewhere this style was known as a torpedo. Paul at this time also introduced what he termed better harmony in colour and it is clear that the early builders were considering the merits of a body's style.³⁴ He also estimated that by January 1909, 200 men were engaged in motor body building in Victoria and said this had grown from just one man in 1898. In 1908 they began adding pin striping although Paul believed this trend was best left on football jumpers.³⁵ Even though Paul held the managerial role at the body works, he continued to design and in 1913 produced what was described as a dainty car with: "...exceedingly pretty dome-shaped guards, raked bonnet, scuttle dash and commodious boot".³⁶ All metal parts were nickel-plated.

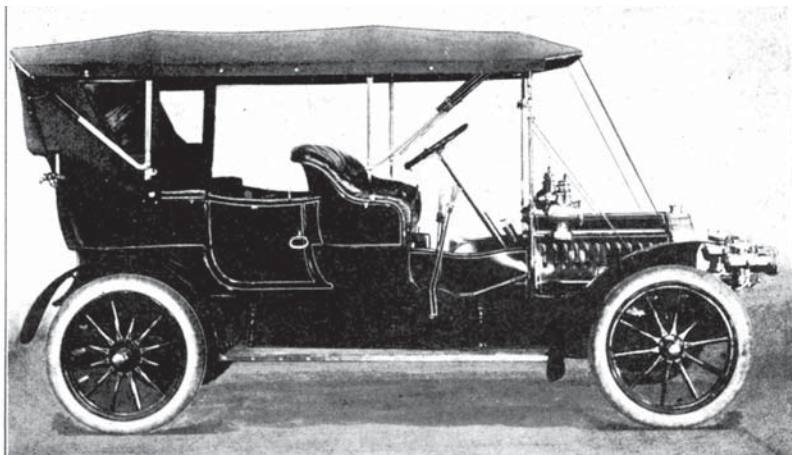


Fig. 3.8
Side entrance Roi de Belges body built by Melbourne Motor Body Builders 1909.

The Australasian Coachbuilder Book of Designs, Plate 631, 226

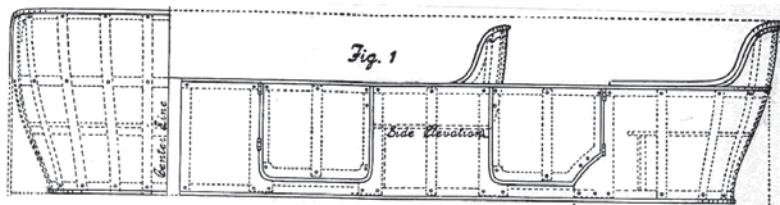


Fig. 3.9
Rotund or Torpedo body design of 1910 showing the straight through sides.

The Australasian Coachbuilder and Wheelwright, 15 April 1910, 13

An early adopter of motor body design and construction was Daniel White “the grand old man of the coach trade”, a title bestowed by the *Coach & Motor Body Builder* in 1923.³⁷ A native of Tipperary, Ireland, White immigrated with his family in 1861 and worked with several employers including Hackett who produced wagonettes. In 1869 he started his own business and quickly established a reputation for producing high-class carriages that led to vice-regal patronage. By 1888 White & Co had a works in Swanston Street, Melbourne, a year later one of the International Exhibition annexes was purchased and White relocated to South Melbourne. When gold was discovered in the West, White established a branch in Perth, but all was not well with the company and he quit and re-established himself in Sturt Street, South Melbourne, with his long-serving employees. White was a foundation member of the Victorian Chamber of Manufacturers and held office for 38 years; he was also a member and past President of the Working Men’s College Council.³⁸

By 1915 the Sands & McDougall directory listed 25 motor body builders in Melbourne when just five listed in 1911.³⁹ Adelaide and Sydney developed along similar lines. Three Adelaide coach builders, Hack & Pengilly, Duncan & Fraser and T J Richards all produced motor bodies by 1905 and all went on to expand into full time motor body builders. At the same time in Sydney the May Brothers, H A Sweeny and the Miller brothers switched from coach building to motor bodies.

The first Australian motor bodies were built from wood and fabric along similar lines to coaches and buggies. L E Cutter in Ballarat claimed in 1911 he had been the first to employ hand-beaten metal panels on a motor body in 1906. The panel beater was a trained coppersmith as the panel beating trade was non-existent at the time.⁴⁰ The body, a coupé, was made under the instruction of Robert Turnbull, later the East Sydney Technical School instructor. At first glance Cutter’s is a bold claim as the early coach builders did not use hand beaten panels, either building up rolled panels on a wooden form, carriage fashion, or, from 1908, employing imported pressed parts from the English firm, Sankey & Son. The panels were limited to three patterns, Roi de Belges, rotund and tonneau.⁴¹ Cutter gained a reputation for high class motor bodies, the first, for a 1909 Rolls Royce Silver Ghost chassis, was built for Gordon T Chirnside in 1911 and: “...featured the latest ideas with the view for comfort and convenience”.⁴² The appearance of Cutter’s body for the Rolls was a very stylish for 1909, far in advance of the Roi de Belges style still being produced. (Fig. 3.10)

Hack and Pengilly of Adelaide claim to have fitted a Roi de Belges style body to an Astor chassis for Vivian Lewis in 1906. The body employed an Australian invention, a swing seat to give access via a side entrance.⁴³ A report comparing a Hack & Pengilly body to an imported Talbot car with the same style body noted the vehicle was: “finished in red Australian leather and workmanship leaves nothing to be desired”.⁴⁴ Hack and Pengilly produced a second swing seat body for W R Bailey in 1907 to fit a home-made chassis using an 9hp engine built by J H Southcott.

The swing seat was patented by Joseph Grummett on 14 June 1905 and enabled the passenger front seat to be swung out providing entrance through the front seat opening and then between the two front seats. (Fig. 3.11) It was a novel approach to the problem of entering from the back where passengers often had to navigate a muddy road during entry and exit. Grummett was a mechanic who appears to have worked for Dan White & Co before going it alone. The patent was not his first attempt at improving a body as he had previously lodged an unsuccessful patent on Hansom Cab door hinges. Another improvement listed by Grummett in his patent application was a sliding rear seat so that a rotund 4-seater body could be converted to a roadster.⁴⁵

The move to steel panels was an added complexity for traditional coach builders. Richard Duncan found it difficult to discard the practice of using wood for panels for example he: “could he adapt himself to the use of metal; in fact it opened up an entirely new department that he could not muster”.⁴⁶ Duncan also believed the initial development of the body industry owed much to the fact that owners wanted something different to the then imported standard body:

The standardisation of models had the effect of developing deluxe and special bodies as an alternative, and the first real attempt to manufacture, that is, any but individual bodies, was due to demand that was created for something different from the standard jobs; and more especially for the Ford chassis.⁴⁷

This demand led Duncan, to vary the American Ford body design significantly, later earning the ire of Ford’s representative when he surveyed the Australian agents in 1923.

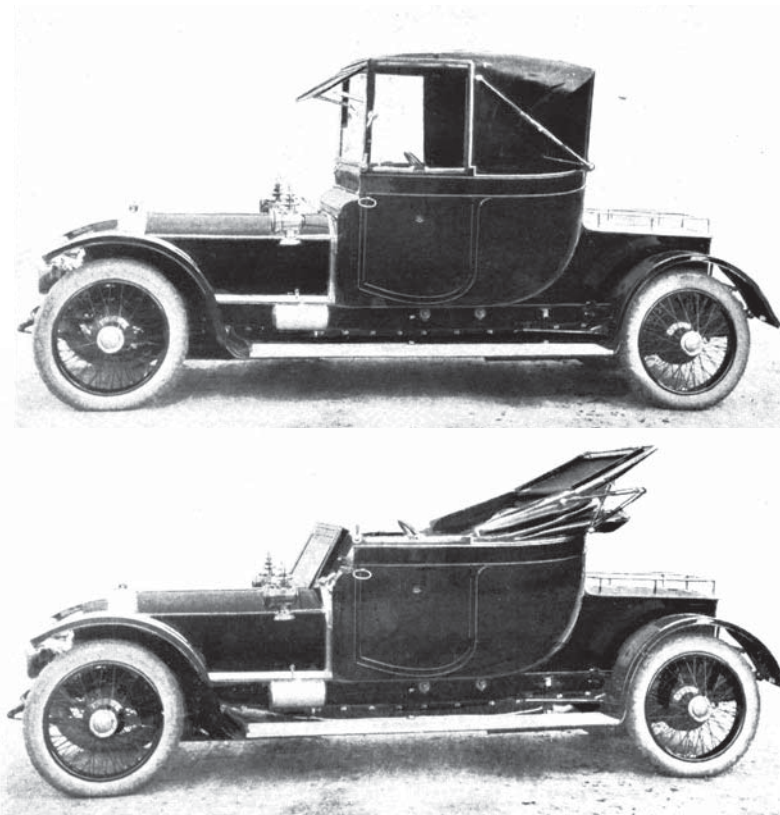


Fig. 3.10
 1909 Rolls Royce with body built
 by L E Cutter of Ballarat for G T
 Chirnside.
**The Australasian Coachbuilder &
 Wheelwright**

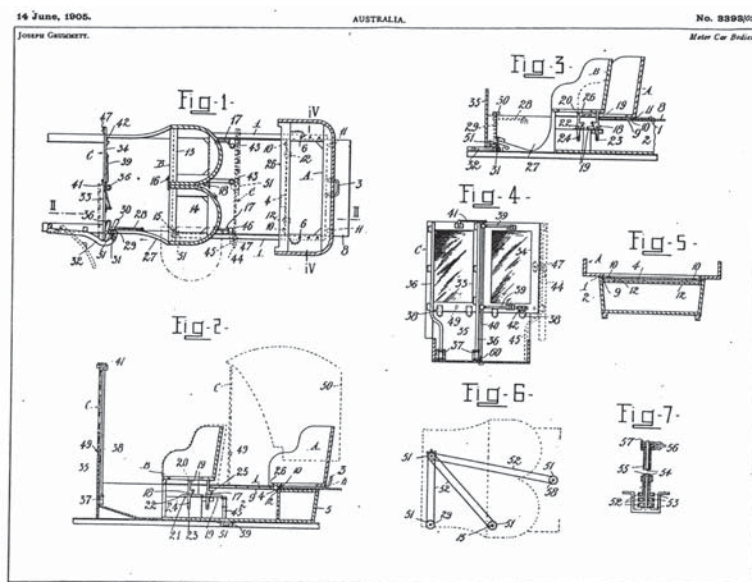


Fig. 3.11
 Joseph Grummett patent for a
 swing seat January 1906.
NAA - Australian Patents Office

In 1908 a new body design arrived in Australia. Garratts Ltd in Sydney, being an early producer of this style, advertised the modern torpedo touring body in October 1909. The body Garretts claimed was: “Designed and executed in our body building department and is without a doubt one of the finest examples of body craft in or out of Australia”.⁴⁸ (Figs. 3.12, 3.13 & 3.14) This style appeared to have first entered Australia on an imported high-class car in winter 1909.⁴⁹

The torpedo style was popularised by Captain Theo Masui who first showed a German car at the London Motor Show in early 1908. The style provided a flush-sided body where the doors were level with the side of the body. The bonnet was swept up to meet the door height giving a pleasing smooth appearance.⁵⁰ The final step, around 1911, raised the bonnet line to equal the body door height, thus creating a uniform body from radiator to rear end panel. Minor changes took place when the Germans introduced visual simplicity by removing mouldings and visible joints.⁵¹ Hence, by 1917 the design of a motor body was established and apart from some European attempts at streamlining, remained relatively unchanged until 1933.

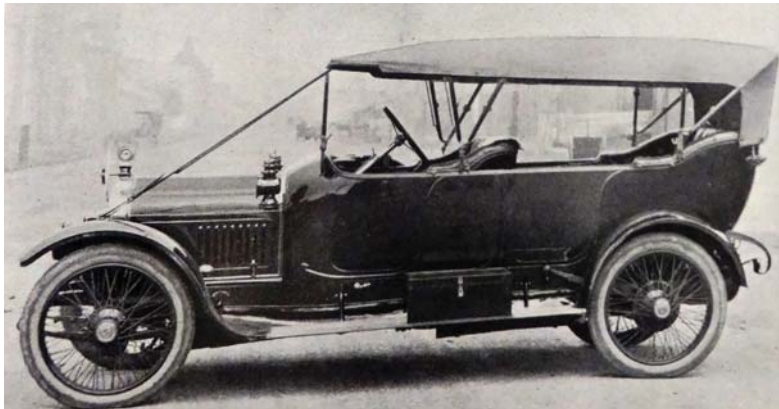


Fig. 3.12
Dan White torpedo bodied Minerva 1912. White's body closely followed the design first shown by Captain Theo Masui in London in 1908.
The Australasian Coachbuilder & Wheelwright, December 1912, 257

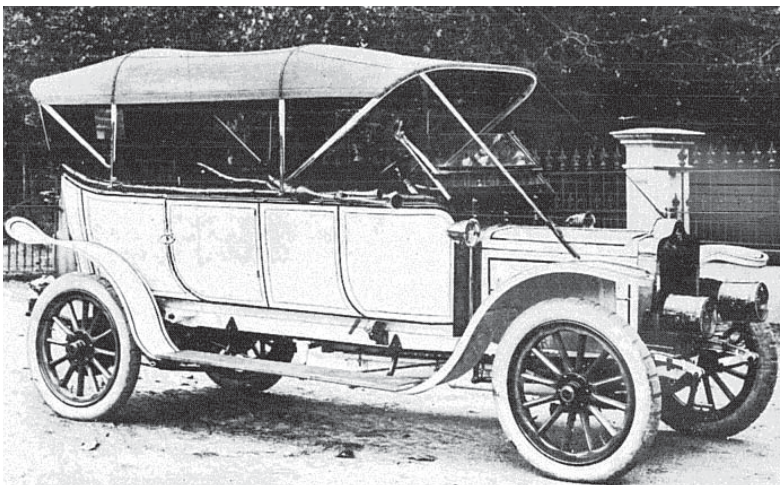


Fig. 3.13
Duncan & Fraser of Adelaide produced this torpedo body in late 1910 for a Talbot chassis.
The Australasian Coachbuilder & Wheelwright, November 1910, 219

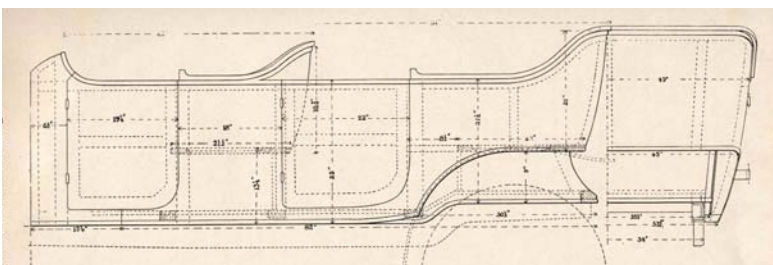


Fig. 3.14
Torpedo body drawing by T H White for Ewing Bros Melbourne in 1909 and reproduced by Albert Bishop in the Australasian Coachbuilder.
The Australasian Coachbuilder & Wheelwright, August 1909, 219

Until the torpedo style arrived a motor body was a very utilitarian affair, particularly for the driver. An early motorist wrote of early body design: “In the early motor cars the driver almost stood up, then the seat went down and the knees came up, for the most we drove with our knees hunched up in our chests developing cramps”.⁵² When the body designer arrived: “our legs shot out in front and our shoulders went back”. The torpedo body provided comfort and style, a selling point.

Tarrant soon advertised that they had created this design at their Melbourne body works under Alex Smith. The body however was not strictly a torpedo and Tarrant’s advertisement states: “the design was created and carried out by Tarrant Motors Pty Ltd”, no date for this is provided, however the vehicle illustrated, a 20hp Rover, is circa 1909/10, well after the first Australian torpedo bodies were sighted.⁵³ (Fig. 3.15) The body was not strictly a true torpedo as the bonnet was not blended into the cowl as can be seen in the Dan White torpedo body of 1912.

Early construction methods

Early motor bodies followed the coach industry and thus manufacturing techniques were the same. With the introduction of the tonneau style, metal panelling was introduced and if a curve was required, wood was used.

The introduction of the Roi de Belges style created more curves into a body and a new trade emerged. Simple curves could be produced in rollers but compound curves required a craftsman to hammer a flat sheet into the required shape. Joseph Sankey & Sons, of Bilston, United Kingdom solved the problem by pressing the curved seat components and selling

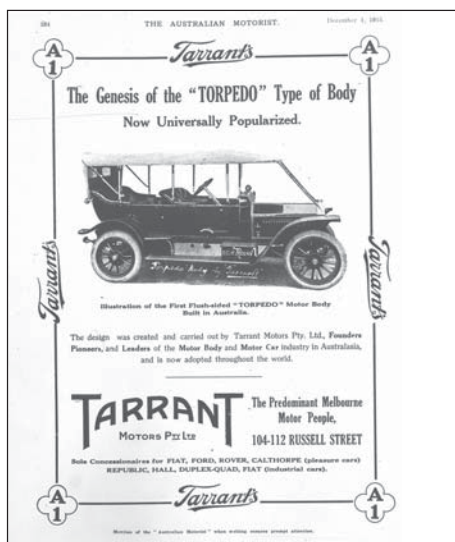


Fig. 3.15
Tarrant advertisement for a torpedo body built on a 1909 Rover chassis.

Australian Motorist 1 Dec 1915, 384

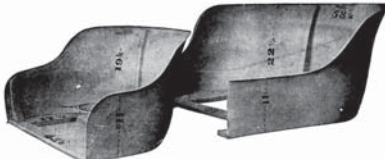
them to body builders.⁵⁴ Sankey established an office in Sydney and from 1908 began to market the seat panels through Andrew Agnew P/L and Keep Bros & Wood.⁵⁵ (Fig. 3.16) Sankey's panels effectively solved a design problem for small body builders, the curves were fixed and consistent and there was no requirement for a detailed layout drawing. In November 1908 when Sankey provided a detailed drawing for publication showing how their pressed seat panels could be incorporated into a motor body, the accompanying text said: "A mistaken impression exists that making a metal panelled automobile requires the services of a high-class carriage body maker. Such is not the case".⁵⁶

To support the metal panelling a wooden frame was constructed with the panels nailed on, the joints hidden under mouldings. This method of construction remained unchanged until the advent of panel presses, metal welding techniques and lead finishing of joints after 1917. The motor body industry also adopted the practice of putting a full-scale drawing, in chalk, on a vertical blackboard as seen in an image of the Melbourne Motor Body Works factory c1910. (Fig. 3.17)

Motor Car Body Manufacture

Sankey's
Panels = =

Roi des Belges
Tulip Rotund



Roi-des-Belges Panels for Side Entrance Car.

Motor Car Body Components

consisting of Slam Locks and Plates, Handles, Hinges, Lamp Brackets, Mat Fasteners, Curtain Fasteners, Turn Buttons, Side Entrance Locks, Bead Finishers, Angle Plate, Tread Plate, and Mouldings

Cape Hood Components

consisting of Hood Joints, Extension Rod, Head Props, Joint Ends, Stump Joints, Curtain Fasteners, Stump Props, Main Props, and Front Props

Wind Shield Components

consisting of Folding Joints, Dash Brackets, Wind Guard Frame, Clips, and Corner Plates

IMPORTANT! The problem of the manufacture of Motor Car Bodies, Wind Shields, and Cape Hoods is solved in using the **MOTOR CAR COMPONENTS, CAPE HOOD COMPONENTS, WIND SHIELD COMPONENTS,** or any Parts of these Components supplied separately

AS IMPORTED BY

Keep Bros. & Wood, 100 Franklin St., Melb.

Importers of Carriage Builders' Requisites, and Manufacturers of Wheels, Bodies and Trimming.

Andrew Agnew
Proprietary Limited

LATROBE STREET,
MELBOURNE,

Are one of the oldest firms of ...

Suppliers of Carriage Material.

From the inception of Motors they have catered for the requirements of those engaged in that industry.

Panels in various popular shapes and all Accessories necessary to a Motor Car carried in stock.

They cater for all classes, and, though not issuing price lists (which are misleading), cordially invite inspection, when their goods will speak for themselves—prices being compatible with quality.

Their stock in Motor requirements is replete with the most modern necessities, whilst they carry a full range of all articles requisite to every department of the Carriage Builder's trade.



Fig. 3.16 Sankey's pre-formed seat panels adverts by Keep Bros and Andrew Agnew in 1909. The panel was first advertised in October 1907 by Sanky's representative, E T Miller.

The Coachbuilder Book of Designs, 1909, 248. & 250



Fig. 3.17
Melbourne Motor Body works
c1910. Chalk drawing of a
roadster body propped on the
wall.
E Ford

Protection and other factors

Geraldine Lazarus argues that despite a strong local growth in motor vehicle demand, efforts to attract capital to produce vehicles locally, as happened in America and Europe, failed. It was not just motor car producers who failed to procure funds, all Australian manufacturers struggled to find capital. Tony Watson suggests this was due to a perceived disadvantage in economies of scale, high variable costs and a booming rural sector, all presenting attractive reasons to invest in agriculture and not vehicle manufacturing.⁵⁷ These factors explain why Australian bespoke auto body shops with their design departments failed to materialise.

The first Australian Commonwealth protection for the automotive industry came in 1902 when imported chassis were charged 5% (except British imports which were free) and bodies were charged at 3% (British) and 35% others. Peter Stubbs argues this was more about raising revenue than promoting a new industry.⁵⁸ By 1906 a Royal Commission on Customs and Tariffs had heard evidence that some form of motor manufacture was possible, yet the evidence was ignored and the Commission endorsed the decision to support the importation of motor wagons for agriculture use.⁵⁹ Effectively, the 1902 body tariff gave the Australian body industry a start, although it took some time to take advantage of the price concession. Comparison of Tarrant's 2-cyl Tonneau of 1904 at £375 with the Model S Ford at £250 meant the local industry required all the protection they could get.⁶⁰

Following the introduction of the model T Ford in 1908, a direct comparison of body cost could be made. An imported 1908 Ford (with body) cost £210, the Melbourne Motor Body works body cost £105, but was significantly better than the imported one, bringing the total price of the Model T to £315. This was an unfair comparison, since Ford and other manufacturers discouraged the practice of removing parts from export packs, enabling a cheaper landed chassis. For example, if the body cost Ford £35 to make, the allowance might only be £10. E W Holden quoted an allowance of between £7-£20 for omitting a GM body out of a CKD pack in 1920.⁶¹

The real difference in body cost was in the method of production as the Ford Company were building thousands of bodies and Melbourne Motor Body made just a handful. Ford used mass production techniques while Melbourne Motor Body Builders bodies were all hand built well into the 1920s. Table 3.1 shows the growth of the coach building industry.⁶²

In 1911 the *ad valorem* tariffs were changed to fixed rate duties, thus the 35% *ad valorem* body tariff moved to £24.5.0. The impact was that cheaper cars with an imported body became more significantly expensive compared to the local product.⁶³

Growth between 1909 and 1913 was significant, particularly for Government coffers. Table 3.2 provides a value of importations on bodies and chassis.⁶⁴ Stubbs makes the point that this early body industry remained largely in the hands of former coach builders, firms that required little investment to move into motor body production as the skills remained essentially the same. In 1913 a total of 836 factories only produced 2,000 motor bodies, a further 4,911 were imported. Stubbs reminds us that many of the factories were also producing horse-drawn vehicles.⁶⁵ Watson argues that in this period (1913) the coach building industry as a whole did not accumulate capital, so the future at this critical time was limited and the technical developments in body building would be stalled and not taken up.⁶⁶ The outbreak of war not only put a damper on imports, particularly those from United Kingdom and Europe, but gave the local industry breathing space.⁶⁷

Training

A problem for motor body builders, and coach builders for that matter, was an absence of formal apprenticeship training. Coach building students gained access to the basic coach class taught by Edward Carlton with J Davine assisting at the WMC from August 1890.⁶⁸ The text used by Carlton *The Carriage Builders and Harness Makers Art Journal* (1861) was donated to the WMC by the State Library Trustees in 1887. The journal provided students with vivid coloured illustrations of coaches and examples of cant scale layout drawings.⁶⁹ Carlton, from a family of English coach builders, was a great teacher and always sought an opportunity to promote his craft. In 1892 he wrote: “The coach body builder occupies a more responsible position in the trade than first appearance. He is in fact the architect of the firm’s reputation”.⁷⁰

Carlton had taken some subjects in coach building classes as early as 1890, that included coach building from 1901 when he became full time, and motor car body making in 1905.⁷¹ (Fig. 3.18) The arrival of the motor car created additional voids in formal training, motor body building as a separate course was not offered at the WMC until 1911 with Carlton in charge. The course needed funding and Frederick Campbell the College’s first director, sought assistance from the Chamber of Manufacturers who in turn lobbied the government for funding. All that happened was a Commission was established to enquire into the question.⁷²

Carlton was protective of his course. In the 1911 *College Quarterly*, in which he had written a detailed essay on Carriage Building and its relation to the motor car, the editor split the last sentence, placing it at the rear of



Fig. 3.18

Body building classes at the Working Men’s College c1910. Possibly Edward Carlton in dust coat and bow tie in the image on the right. Student in the foreground preparing a draft to scale.

RMIT University Archive

the quarterly. The file copy in the RMIT University archive has written in Carlton's hand: "Owing to lack of appreciation of the subject, the Editor placed the conclusion portion of this article on page 29 under the heading of College notes, E.C".⁷³

By 1911 College's coach building, carriage drafting, and motor car body making course comprised technical arithmetic, wood working, free hand drawing, geometrical drawing and development in a preliminary year, followed by three-years of theory and practice. By the third-year students were expected to project full size side elevations to the horizontal (this was the French Rule) and be able to layout seven different types of coach and or motor bodies.⁷⁴

In Sydney technical training commenced under James Brown, a Scottish engineer who emigrated in 1884. Brown, whilst working for Hudson Bros, was approached by their apprentices to be taught geometric drawing at the Granville School of Arts in 1884. Brown was appointed the teacher of mechanical and geometric drawing which took place at the newly formed Grantville Trades School (now South West Sydney Institute) in 1885, later becoming the Resident Master.⁷⁵ A year later the Sydney Mechanics School of Arts (later the Sydney Technical College) began teaching Mechanical Drawing.

In late 1906 the College advertised for an instructor in coach building, a position filled by John Moore who had been apprenticed under his father and then trained in Europe and America to gain experience in drafting and design. East Sydney Technical School also pursued motor body building under the direction of Robert Turnbull in 1907, who had trained with Duncan & Fraser, worked for Cutter in Ballarat, being one of the first motor body builders to form metal panels.⁷⁶

Australia's first body designers

Identifying specific early body designers is not easy. In terms of influence the Bishop brothers, Joseph, William and Albert, set the direction of Australian coach building and motor body building. The brothers came together to run J E Bishop & Co, publishers of *The Australasian Coach builder and Wheelwright*. A fourth brother, John (1873-1931), took a painter and decorator apprenticeship, eventually becoming a journalist. The brothers grew up in Beechworth, where their father was a coach

builder. When he died young and his firm failed Joseph went to Melbourne for work as a coach builder. Bishop junior took further schooling at the WMC, chairing their Literacy and Debating Society in 1890.⁷⁷

One morning Bishop picked up a copy of the newly published *The Australasian Coach builder and Saddler and Liveryman*. Unimpressed with the quality of content he wrote to the journal with his ideas how it should be done. The result was an offer to become the editor, a position he readily took and relished. In 1892 Bishop moved to Sydney continuing to edit the journal and adding pages. Shortly after arriving he was offered the journal and J E Bishop & Co was established. As the journal grew Bishop employed his brothers William and Albert in the business.⁷⁸ Albert, had a natural talent for design and drafting and he began interpreting overseas drawings and sketches, turning them into scale presentations each month. According to *Table Talk* in 1894 its: “Employees were efficient draftsmen, and from a literary technical, or artistic point of view, an excellent periodical”.⁷⁹ (Figs. 3.19 & 3.20) By 1901 images of automobiles began to appear in the journal and *The Coachbuilder Book of Designs* published by the Bishops in 1902 featured automobiles. In 1917 the journal became *The Coach and Motor Body Builder for Australia and New Zealand* and closed in November 1952.⁸⁰ (Fig. 3.21)

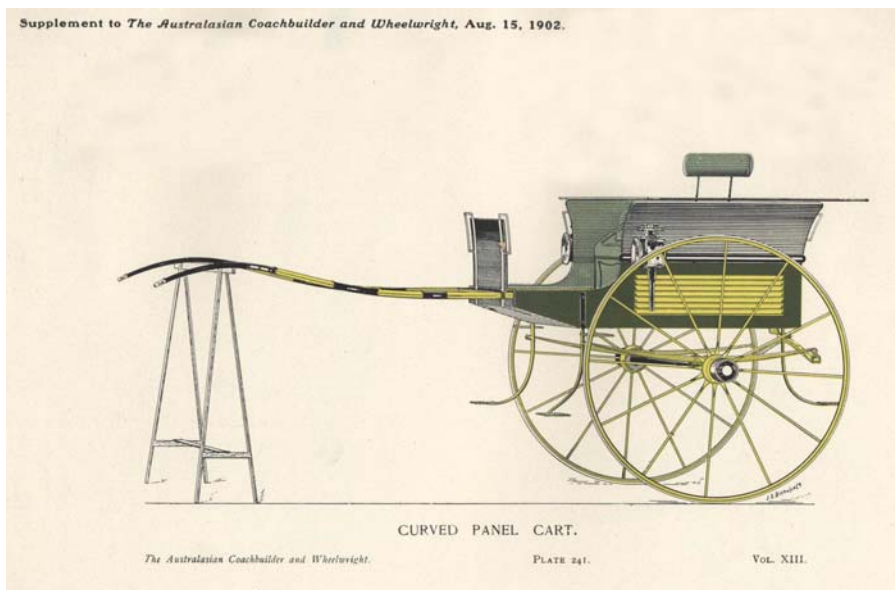


Fig. 3.19
Fashion plate penned by Albert
Bishop in 1902.

**The Australasian Coachbuilder &
Wheelwright, August 1902**

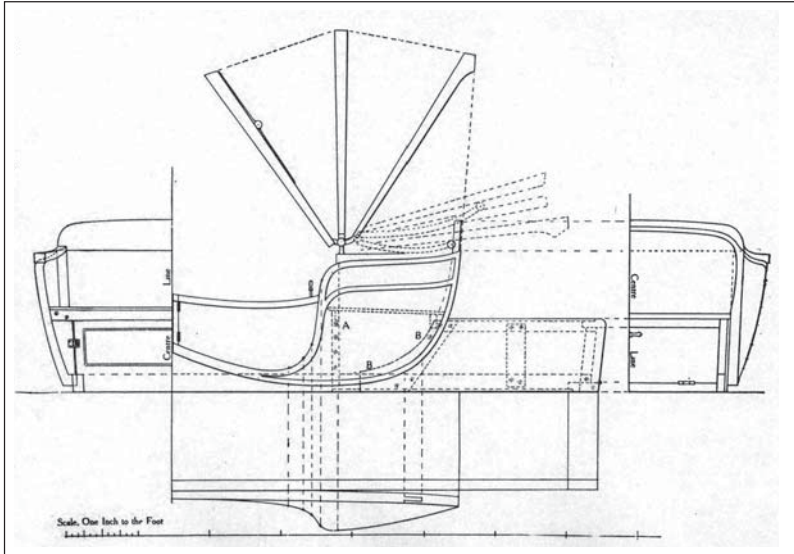


Fig. 3.20
 1909 two seater body drafted
 by Albert Bishop.
**The Australasian Coachbuilder &
 Wheelwright, March 1907, 202**

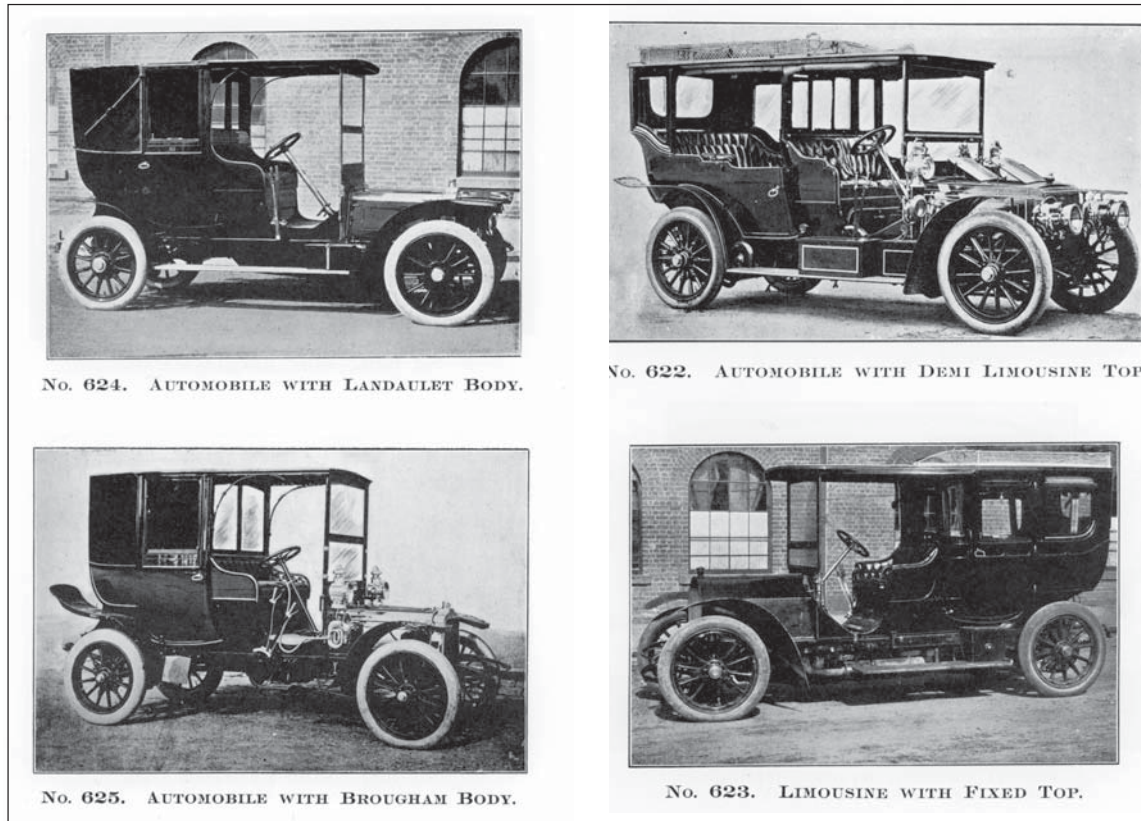


Fig. 3.21
 Double page spread from the Bishop Bros. The Coachbuilder Book of Designs 2nd Edition
 Enlarged 1909.
Bishop Brothers

Summary

Motor body building was slow to develop in Australia. A lack of capital prevented those early coach builders who sought to diversify into motor body production from re-equipping their factories to produce cost effective units efficiently. Thus, the Australian industry emerged slowly with existing firms taking up motor body orders, some producing them using existing trades, methods and equipment.

As demand for motor cars grew a few entrepreneurial coach builders established motor body departments, and following overseas design trends and styles closely, produced bodies that looked as good as, if not better than, imported ones. Australia's small population limited demand for bespoke high-class motor bodies and this in turn limited the development of an automotive design culture.

The identification of Australia's first body designers is restricted to a handful of craftsmen, men who readily adapted to wood framed metal bodies, and recognised the need to design and build for Australian conditions. Supporting this small group of designers were the Australian coach and motor body journals of the time, journals that followed overseas trends and interpreted them in published drawings and images. New body designs were adopted rapidly, the wooden bodied Stanhope design of 1898-1904 was quickly replaced with the steel bodied Roi de Belges design in 1905. The torpedo style emerges four years later, a style that for the first time provides clean lines.

In the space of six or so years form is evident in Australian body design. The coach builder from pre-1900 was now an automobile designer, although hamstrung by the constraints of a foreign manufacturer's chassis, radiator, bonnet and dashboard, he nevertheless knew what constituted a pleasing line.

At the close of 1913 there is recognition by the government that body production should be encouraged, and protected. Progressive body builders saw a positive future and sought to travel overseas to study trends and construction methods, returning to modernise their workshops only to be thwarted by the outbreak of war. A war that would in turn create greater opportunities and incentives for those who could adapt to a changing world where the automobile would be seen as a necessity rather than a luxury. The following chapter explores Australia's automobile design direction because of war.

Table 3.1 Comparative Table - Body building activity 1909 - 1913

	1909	1913	1909-13 %	1909-13 %
No of factories*	720	836	16.1	17.7
Employment	6,282	6,928	10.3	26.5
Value of output	£1,378,000	£1,865,000	35.3	52.5
Av wages	£82.12.4	£102.3.10	23.7	

* Includes traditional coach builders and motor body builders.

Source. Stubbs, P 1972, *The Australian Motor Industry*, Melb. Vic: Cheshire, 6.

Table 3.2 Comparative Table - Body building value 1909 - 1913

	Motor Bodies £	Motor Chassis £
1909	62,000	425,000
1910	96,000	694,000
1911	160,000	1,018,000
1912	220,000	1,451,000
1913	216,000	1,333,000

Source. Stubbs, P 1972, *The Australian Motor Industry*, Melb. Vic: Cheshire, 5.

Endnotes

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- 16 Harry Paul, "Body Building," *The Australian Motorist*, 20 April (1909), 409.
- 17 Dalgety & Co., formed in 1884, was a pastoral company with branches in all Australian states. Motor Agencies were quickly established in Melbourne, Sydney, Brisbane and Perth.
- 18 "Dalgety and Co Motor Body Works," *The Australian Motorist*, 2 June (1913), 1165.
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- 24 “The Stanhope Phaeton Automobile Body,” *The Australasian Coach builder and Wheelwright*, March (1904), 146-7; Named after Fitzroy Stanhope an English minister who had a light 2-seater horse drawn gig made to his design. The horseless carriage version arrived around 1898 with tiller steering and high-wheeler-style wheels. See W Haajanen, 2003, *Illustrated Dictionary of Automobiles*, 131.
- 25 Tonneau or Tonneaux is French for tub or cask.
- 26 J Wood, *Coachbuilding: The hand-crafted car body* (Oxford: Shire Publications Ltd 2008) 9.
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- 49 J.F.R.S. “Motor Car and Show,” *The Sydney Morning Herald*, 26 March 1910, 5.
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- 51 Penny Sparke, *A Century of Car Design*, Barron’s (Hauppauge, USA: Barron’s 2002), 10.
- 52 “Motor car body design,” *Geelong Advertiser*, 14 April 1914, 8.
- 53 “Tarrant Motors Advertisement,” *The Australian Motorist*, December (1915), 384.
- 54 Wood, *Coachbuilding: The hand-crafted car body*, 19.
- 55 Bishop, *The Coach builder Book of Designs*, 48 & 250.
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- 57 Tony Watson, “Government Policy and Two World Wars: Shapers of the Australian Automotive Industry,” (Master’s Thesis, Deakin University, 1990).

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- 64 "Motor Parts and Bodies," *Geelong Advertiser*, 17 August 1917, 4.
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- 66 Watson, "Government Policy and Two World Wars", 16.
- 68 Technical developments included larger pressed panels, improved welding techniques and the all-steel body (first introduced by Edward Budd in 1912 for the Model 32 Hupmobile).
- 69 S Murray-Smith and A Dare, *The Tech: a Centenary History of the Royal Melbourne Institute of Technology* (Melbourne: Hyland House Publishing Pty Ltd 1987), 75 & 312.
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- 71 Carlton, "Coach Body Making," 4.
- 72 Later coach building, Carriage-Drafting; S Brown, "Vehicle Construction and Drafting," email Brown to Edquist, 31 January 2015.
- 73 J De Lacy, "Apprenticeship," *The Coach and Motor Body Builder*, January (1933), 259.
- 74 Edward Carlton, *RMIT College Quarterly No 7*, RMIT University Archive, Melbourne Vic, 1911.
- 75 Edward Carlton, *Prospectus*, Working Men's College, RMIT University Archive, 1911, 145.
- 76 "Vocational Training Class at Sydney," *The Coach and Motor Body Builder*, 15 May (1920), 23.
- 77 "Coachbuilding at the Sydney Technical School," *The Australasian Coach builder and Wheelwright*, Jan (1907), 211; "Obituary Robert S Turnbull," *The Coach and Motor Body Builder*, October (1933), 133; Victoria under the influence of Joseph Bishop senior who had in 1856 emigrated with his wife and seven children from Somerset, England. Initially attracted by gold, Joseph fell back to his trade, coach building, in Beechworth. Joseph senior's death at 47 left his eldest boy, Joe, then aged 20, with his mother, Mary Ann, struggling to keep the business going. Around 1885 J E Bishop Coach building failed and young Joe came to Melbourne
- 77 "Working Men's College Literacy and Debating Society," *The Age* (Melbourne), 26 March 1890, 9.
- 78 Clare Brown, *Driven by Ideas: The story of Arthur Bishop* (Sydney: UNSW Press 2003), 2.
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Chapter 4: An intervention WW1

Industry adjusts

The outbreak of war had little initial impact on the Australian automotive industry. The rapid growth from 1909 to 1913 did cease and imports of chassis from Europe dramatically slowed, but the slowdown was short lived as imports from North America quickly filled the void. An examination of the NSW and Victorian registrations shows a continual climb from 1911 through 1921 to a point where there was one car for every 62.4 Victorians and one for every 65 New South Welshmen.¹ During the period 1914-1917 the design of motor bodies changed little, the torpedo body of 1912 was essentially still being produced in 1917. Overall total chassis imports fell from £1,349,000 in 1914 to £868,000 in 1915 [see Table 4.1].² This section will show the development of vehicles of war and the impact of war on the automotive industry.

In 1916 Horace Harrison, President of the Federal Chamber of Automotive Industries, argued that the motor car was no longer a luxury, it was, he said an essential tool. The war effort confirmed this thinking, as for the first time the motor industry played an important role in warfare. For example a new demand arose for ambulances. The Patriotic Funds that gathered momentum in every major city wanted their money spent on a tangible asset and an ambulance fitted the bill. Both private owners and motor dealers donated new and used motor chassis for the purpose. Some owners removed their car's body and privately organised an ambulance body and appeared at the docks when the wounded were returning, offering transport to a place to convalesce. (Figs. 4.1 & 4.2)

Harley Tarrant was interested in applying the motor car to army use and was one of several motorists who wanted a unit that represented them.



Fig. 4.1

Locally built ambulances on Cadillac chassis. **Australian Motorist 1915**

He lobbied the army who allowed him to form the Australian Volunteer Automobile Corps (AVAC) on 9 May 1908. The army agreed to pay out of pocket expenses to the members who were all officers as long as they were in possession of an efficient and reliable automobile and agreed that if damaged, the automobile would not be repaired by the Army.³ Tarrant was keenly interested in the military; he had commenced his military involvement in 1890 with the Victorian Mounted Rifles (VMR) gaining a probationary Lieutenant's commission. In 1908 he recorded: "It dawned on me that (motor vehicles) could be used by the military forces. I got permission to form a volunteer automobile corps".⁴ When war broke out Tarrant's partner, Howard Lewis enlisted and was commissioned as Captain of the AVAC in 1914.

In September 1914 a call went out for vehicles, drivers and mechanics.⁵ A growing fleet was gathering at the Army's storage sites in Melbourne at the Domain and Albert Park. Donations of trucks were pouring in as dealers recognised the benefits of publicity and patriotism.⁶ (Fig. 4.3) The Commonwealth was asked to supply 145 motor wagons and 250 trained motorists to the British Army. To oversee this supply the Defence Department established the Motor Transport Board on 3 September 1914. Tarrant and F Bracey (Dalgety & Co) were appointed to advise the army. Tarrant held an honorary Colonel's commission but Bracey had not enlisted. Australian Chief of General Staff, Colonel J G Legge who recommended the Advisory Board later recorded: "There was no one in the Defence Department having sufficient mechanical or otherwise requisite knowledge to enable them to go into the market and purchase these vehicles".⁷

Tarrant's appointment to the board in 1914 earned the ire of a new Labor Government looking to smear the previous Government's appointments.

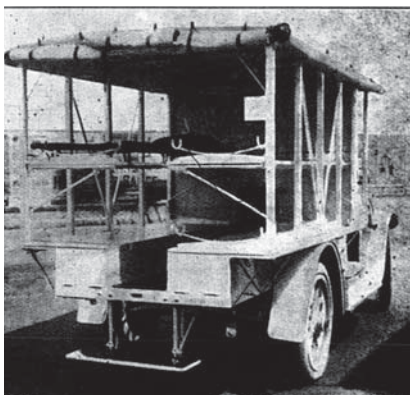


Fig. 4.2
Far Left.
Ambulance design
and construction
was simple
using timber and
canvas.

Australian Motorist
Fig. 4.3

Left. Australian
designed Army
truck bodies.

Australian Motorist
June 1915

Tarrant was accused of conflict of interest and resigned from the board on 17 June 1918.⁸ Joe Rich has studied the claims and counterclaims of impropriety by Tarrant and others during the period, reminding us that Tarrant was unpaid, had heavy demands placed upon his time, all of which took a physical toll upon his health. That Tarrant Motors profited was inevitable given their size but that Tarrant set out to profit from war time activity was not proven and the government awarded him an MBE for his services in 1920.⁹

Aided by Colin Timms and Cecil Dwyer, the Advisory Board organised a series of tests for aspiring army drivers and mechanics and the Melbourne Omnibus Company loaned buses in which tests were held. By October 1914, 54 new and 77 used truck chassis were promised and the process of having British Army specification bodies fitted was underway.¹⁰ The purchase of trucks included several German brands that led to a political storm and accusations Tarrant and Bracey were feathering their own nests as both supplied trucks through their agencies. This initial disquiet died after it was announced that the 26 German lorries were second hand and had to be used as there were insufficient new trucks available.¹¹

One of the first orders filled was for six mobile workshops, complete with lathes, machinery and motor spares. On 23 October 1914 the Motor Transport Board organised a procession of men and vehicles from Spencer Street rail head to the Domain. Buses, cars and trucks of the new Army Service Corps, the Ammunition Park Supply column companies, all decked in army colour, transported the men who had arrived by train from Adelaide and Sydney, to Albert Park and the Domain for training.¹²

Individuals also rallied to do their bit. A dentist set up a mobile dental surgery that was self-contained and he then enlisted with his vehicle. A Dr Ferguson Lemon had J Munro and Company supply and design a mobile X-Ray laboratory that Lemon fully equipped.¹³ (Fig. 4.4) By March 1915 the Victorian Military Garage had 50 ambulances, all donated, some for overseas use. One was a fully equipped mobile operating theatre.¹⁴ H V McKay turned his Sunshine works into war production, producing several hundred Furphy style water tanks in two weeks.¹⁵

In mid-1915 motoring enthusiast, Lt. Ernest James, concluded Australia needed armoured cars. Having read reports of British versions he gathered like-minded engineering motorists to see if they could build their own. On 12 July 1915 James wrote to the Minister of Defence with his ideas and

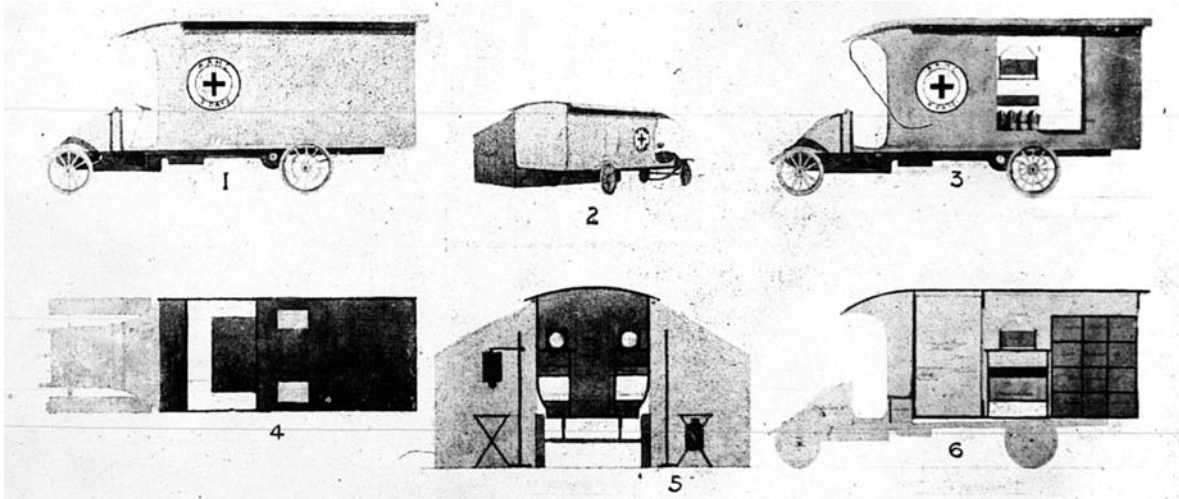


Fig. 4.4

Australian designed mobile X-ray laboratory.

Australian Motorist June 1915

an offer to raise and equip a unit. By August he had submitted plans and drawings and received both financial and physical support for the project. Ivan Young of Nhill provided a Daimler chassis and Percy Cornwell his racing Mercedes chassis. Young would become a Sergeant and Cornwell a Lieutenant in the unit. Both cars were chain drive as this was the drive system preferred by the British armoured car builders. The years are unknown, but Cornwell had been racing his Mercedes for at least two years and Daimlers began to use shaft drive cars from 1908. A third car, a Minerva, donated by Melbourne businessman Sol Green, was used as a tender vehicle.¹⁶

James was well attuned to automobile design and construction having run E H James & Co at 103 Flinders Lane, Melbourne, since 1908. The firm sold and maintained White steam cars, Swift cars, Treskow motor cycles as well as holding agencies for Fairbanks-Morse oil engines and Cooper sheep shearing equipment.¹⁷ James secured the services of Vulcan Engineering works in South Melbourne where H W Beckett provided free use of tools and space for his fellow enthusiasts and they began to construct two armoured cars.¹⁸ English armour plate 3/32 inch thick was found in the yard of Robinson Brothers & Co and donations flowed from Barnett Glass Rubber (tyres), E T Millar (Sankey wheels), the Victoria Rolling Mills, J A Linacre, J W Trill, Ralph Banks, W P Thompson & Co and James' own firm, now trading as Accessories Ltd.¹⁹ The turrets rotated 360° and were armed with Colt model 1895 machine guns. A spare gun was carried in the car. All members of the unit could drive, shoot or work as a mechanic.²⁰

In April 1916 the 1st Australian Armoured Car Section, comprising 12 men, under Lt E H James commanding a Daimler (LC0726) called Gentle Annie, a Mercedes (LC0727)²¹ called Silent Sue, a support Minerva and a New Hudson motor bike and outfit with machine gun were formally accepted by the army at the Victoria Barracks.²² (Figs. 4.5 & 4.6) On 20 June 1916 the unit boarded HMAT A13 *Katuna* for the trip to Egypt arriving on 9 August when the unit was renamed the 1st Australian Armoured Car Battery. The armoured cars were partly successful but as they weighed 2-tons bogged quickly in soft sand. On 3 December Lt James was recalled to the British base of Changa Oasis where the armoured cars were exchanged with six very battered and dilapidated Model T Fords. At this point the unit became the 1st Australian Light Car Patrol.²³

James and his crew spent several weeks rebuilding the Fords which were little more than a chassis, cowl, bonnet, seat and Lewis gun. Still, the unit acquitted itself over the next 12 months without casualty in Egypt and Syria against the Turkish and German armies (one member died from malaria). After a year of distinguished campaigning James was ordered to return to base where 6 new Model T Fords awaited. He recorded in his diary this Red letter day, expressing his joy at handing back the Six

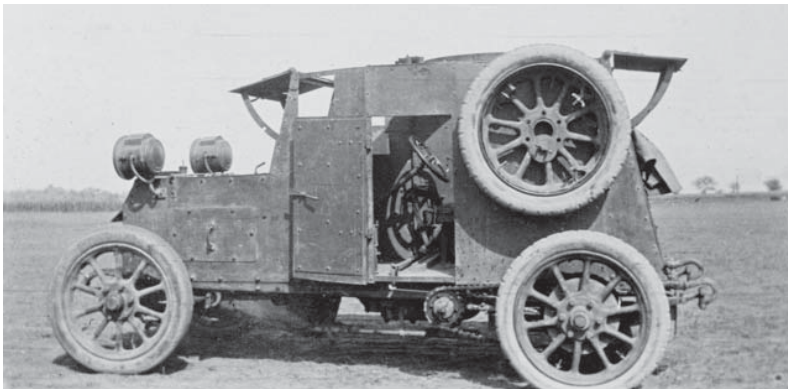


Fig. 4.5
Australian Armoured Car named "Gentle Annie" was based on a Daimler chassis.
Australian War Memorial Image no. B02865

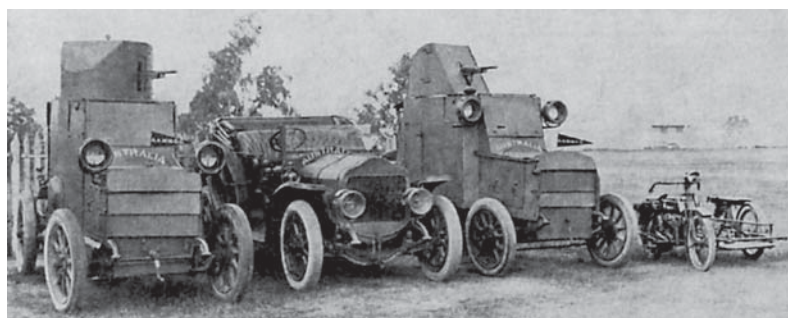


Fig. 4.6
1st Australian Armoured Car Section comprised two armoured cars, a Minerva car and a side car outfit.
Rod Dux

derelicts of cars.²⁴ The design of the six new cars showed some purpose and a resemblance to a Renault built in Queensland in 1914.

The Renault was a donation to the war effort by the Canada Cycle & Motor Agency in Brisbane, but it went further as the local Canada Cycle & Motor Agency manager, Alexander Wynard-Joss was a former Major and Commander of the 5th Queensland Imperial Bushmen's Cycle Corps that saw service in the Boer war. Working with Col. G L Lee, Wynard-Joss designed a utility body for the Renault that would support a Maxim or other quick firing gun.²⁵ A searchlight was also installed, a donation of the Trackson Brothers, and Barnett Glass donated a set of tyres.²⁶ (Fig. 4.7)

The Renault went to Egypt in 1914 with the divisional Light Horse Unit, but its fate is unknown. The British called the factory-built stores carrier a Box Car; however, the bodies of the later 1917 Ts were more purpose built or modified in the field to suit their particular military application. In fact, the first British Light Car Units in Egypt used T Ford tourers from the Ford Manchester plant, but bodies were soon discarded and replaced with little more than a packing case.²⁷ By mid-1916 the utility style bed with rolled sides was introduced and by the end of 1917 a well-side pickup bed, very similar to the Renault unit, was seen. As to who did the design or supplied the Australians their T Fords in 1917 is unknown.

As a postscript to the Australian war effort, a World War 1 tank Mk IV was imported into Australia for fundraising purposes on July 1918. Its last appearance was in December 1919 on the St Kilda Esplanade. The tank, named Grit, toured the eastern states before being parked in the War Memorial at Melbourne's Exhibition Buildings. It was then moved to the Canberra War Memorial in November 1941 where it remains. No

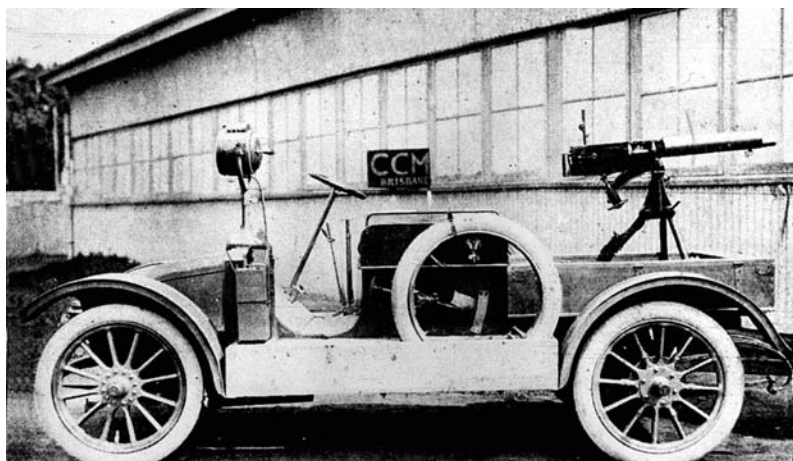


Fig. 4.7
Renault based machine gun
carrier designed in Brisbane.
Australian Motorist October 1914

attempt was made to investigate the engineering of the tank and it appears to have been simply a political means to raise money.²⁸ A further decision by the Government Board of Business Administration in November 1918 recommended that in the interests of standardisation future military purchases should be restricted to vehicles supplied by agents of the Ford car in the several states.²⁹

The design of the tank may have taken a different form if not for the ineptitude of the British War Inventions Office. Adelaide born engineer, Lancelot Edlin de Mole in 1911 concluded a “tracker or railed” vehicle was essential for traversing rough country and therefore could be used to quickly move munitions safely. In 1912 de Mole sent sketches of his tracked armoured vehicle to London for assessment only to receive a rejection letter the following year.³⁰

Following the outbreak of war de Mole enlisted and whilst in France attempted to revive his tank design and built a model. (Fig. 4.8) He gained access to Captain Wilson of the Tank development section who wrote a report, later described by Colonel Johnson as, “not being a reasoned and proper report, the criticisms are not justified”.³¹

Johnson’s comments came at the Royal Commission into war invention awards at which de Mole was provided £965 for expenses in developing his tank. The tragedy was that de Mole’s idea sat hidden in a storeroom, unknown to the men on the Landship Committee.³²

On 29 November 1919 the *London Illustrated News* published a full-page story on de Mole’s design with the headline “Better than the Somme Tanks of 1916 – a 1912 model”. (Fig. 4.9) De Mole’s design contained an innovative steering mechanism, a bending track, an idea used on the WW2 Bren Gun Carrier. De Mole’s design was probably beyond the comprehension of the British War Inventions Committee assessors who believed such an unproven idea would not work, so they never passed it on.³³

During WW1 the Tarrant Company contracted to build three Renault 70hp Aero engines for the Australian Flying Corps. Tarrant apparently gained the order via the flying school instructor, Eric Harrison, who had worked for Tarrant. Other airmen in the Flying Corps, who also worked at Tarrant were Harry Hawker, Harry Busteed and Harry Kauper.³⁴ The contract was overseen by Otto Malmgren who had approached Tarrant in 1899 as a lad

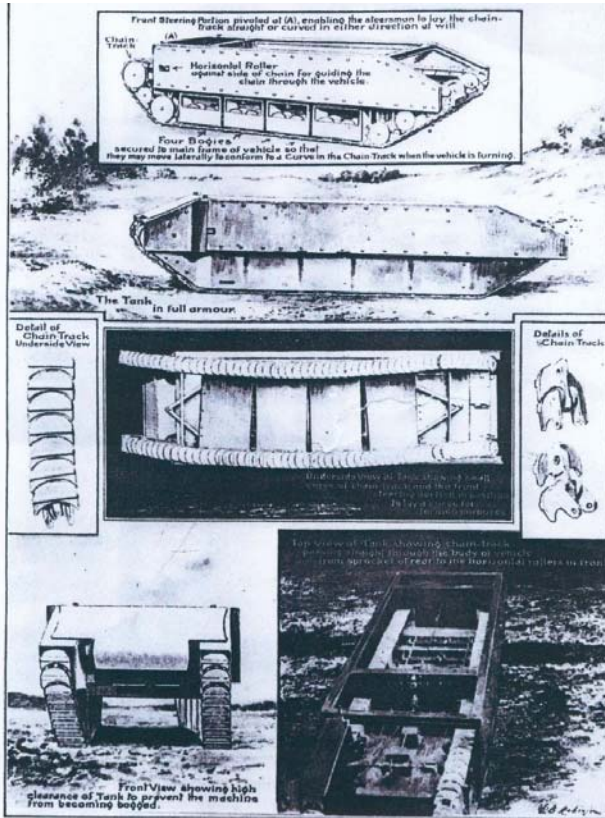


Fig. 4.8
 Above. Model of de Mole's tank made by de Mole and now held by the Australian War Memorial.
Australian War Memorial Neg no Relawm 01900

Fig. 4.9
 Left. Sketches and images of de Mole's tank design as published in the London Illustrated News in 1919,
The Navy, Army & Air Force Journal

seeking a sponsor for his studies and experience in England. Malmgren spent seven years overseas and when he returned in 1907 he became Tarrant's workshop manager.³⁵ When Tarrant's Autocar Industries closed in 1923 Malmgren arranged to purchase a portion of Tarrant's business through Phoenix Motors Pty Ltd.³⁶

Summary

The move to war production legitimised the automobile as an essential commodity. Vehicles were transporting men and goods in a nation-building endeavour. Some unique vehicles like armoured cars and specific purpose lorries (ambulances) were produced and these revealed that despite Australia's isolation, local designers could produce worthwhile design.

Table 4.1 IMPORTS

Origin	Motor Chassis		Motor Bodies	
	1914	1915	1914	1915
	A£	A£	A£	A£
Canada (T Fords)	212,320	213,429	45,792	46,632
UK	430,466	163,090	67,512	32,213
France	117,307	35,340	-	-
Italy	59,098	67,580	3,574	3,030
USA	430,884	372,529	110,672	97,194

Source. "Import Statistics" , 1916, *The Australian Motorist*, 1051.

Endnotes

- 1 Peter Stubbs, *The Australian Motor Industry: A study in protection and growth*, Cheshire for the Institute of Applied Economic and Social Research (Melbourne: University of Melbourne), 1972, 7.
- 2 "Import Statistics," *The Australian Motorist*, 1 May (1916), 1051.
- 3 R N L Hopkins 1978, *Australian Armour* (Canberra: Australian War Memorial, 1978), 12.
- 4 Joe Rich, "Impropriety in the defence department? Favouritism in the Allocation of Military Orders During World War 1," in *Australian Journal of Politics & History*, Vol. 38, No. 2 (1992), 207.
- 5 "His Majesty Calls Australia to Supply Motor Transport for Imperial Army," *The Australian Motorist*, 1 October (1914), 123.
- 6 The Division was largely formed through the purchase and refurbishment of motor lorries, both new and used. See *The Benzine Lancers*, 22-38.
- 7 Rich, "Impropriety in the defence department?," 207.
- 8 The conflict came from Tarrant making procurement decisions for both vehicles and work performed by his company, Tarrant Motors.
- 9 Rich, "Impropriety in the defence department?," 214; Tarrant's daughter, Doreen Holmes, claims Rich's statements were incorrect in an interview with military historian Malcolm Grant.
- 10 "His Majesty Calls Australia to Supply Motor Transport for Imperial Army," 123.
- 11 Rich, "Impropriety in the defence department?," 207; "His Majesty Calls Australia to Supply Motor Transport for Imperial Army," 123.
- 12 "Motor Ammunition Park in Melbourne's Domain," *The Australian Motorist*, 20 November (1914), 219.
- 13 "The X-Ray in War," *The Australian Motorist*, 1 September (1914), 61".
- 14 "The Home Service Auto Fleet at Victoria Barracks, Melbourne," *The Australian Motorist*, 1 March (1916), 809.
- 15 "Largest Parade of Motor Vehicles yet held in Australia," *The Australian Motorist*, 1 December (1914), 313.
- 16 David Finlayson and Mike Cecil, *Pioneers of Australian Armour* (Canberra: Big Sky Publications, 2015), 6.
- 17 "Messrs E H James & Co," *The Australian Motorist*, August (1909), 661.
- 18 "Cycles and Motors," *Weekly Times*, 4 March 1916, 23.

- 19 David Finlayson and Michael Cecil, 12; "The First Australian Armoured Car," *The Australian Motorist*, 1 March (1916), 853.
- 20 E H James, "The Motor Patrol," unpublished memoir held Australian War Memorial, File 224 MSS209, 1941.
- 21 LC numbers were added on landing in Egypt to comply with the British numbering system.
- 22 "Two Armoured Motor cars presented to Minister," *The Weekly Times*, 6 May 1916, 23.
- 23 Finlayson and Cecil, *Pioneers of Australian Armour*, 11.
- 24 Rod Dux, *The Benzine Lancers 1901-1919*, (Brisbane: Rod Dux, 2012) 104.
- 25 "He led 52 Q'land cyclists against Boers," *Courier-Mail* (Brisbane), 15 January 1954, 5
- 26 "A Liberal Gift from Queensland," *The Australian Motorist*, 1 October (1914), 129.
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- 28 Finlayson and Cecil, *Pioneers of Australian Armour*, 245.
- 29 Rich, "Impropriety in the defence department?," 207.
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- 33 "Tarrant Aeroplane Engine - Made in Australia," *The Argus* (Melbourne), 30 August 1915, 4.
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Chapter 5: Post war Australian automobile design

Following WWI and the embargo on motor bodies, a number of companies and inventors began attempts to produce an Australian designed car. By 1920 there were several, like the Australian Six, the Lincoln Six, Summit and Chic that had moderate success, while others struggled to get past the prototype stage. Some incorporated overseas designs and mechanicals with local assembly, bodies and minor local components, some had a degree of local design but very few showed any real innovation. The major hurdle for designers and innovators was both a lack of capital and business acumen.

It would be expected that in Australian car projects local design would be prominent however this was not the case as in most of the efforts the principals were salesmen and entrepreneurs. Nevertheless Australian cars documented here all contained some element of local design, if only related to the body and combination of putting together a chassis, engine, transmission and axle, all from different sources. In this period the total design package can only be seen in two Australian vehicles, the Roo and Southern Cross. One other, the Eco, had a high Australian design content, relying only on an overseas engine and transmission.

While some Australian cars produced between 1918 and 1930 contributed to automobile design, some of it recognised internationally, the majority failed due to insufficient capital, lack of business expertise or a failure to convince large overseas companies that their idea, their design, was better than one already employed.

The Lincoln Six

Perhaps the most successful Australian cars prior to the Holden were the Australian Six, Lincoln and Summit, produced between 1918 and 1925. The first to achieve production was Charles Innes with the Lincoln Six that was planned and designed around imported components over four years.¹ Born in 1883 in Keith, Scotland, Innes immigrated to Sydney in 1908 and then married Adeline Kemp in 1912.² He registered a Design (no. 2525) for a *Basket weave effect on a motor body* on 3 September 1917, an idea used on high-class European cars in the early 1920s and again in the 1930s that gave the effect of wickerwork by gluing cane to the body.³

It is unknown if Innes or others used his patent. One design feature of the Lincoln was a low centre of gravity, an aspect required to provide stability on rough roads.

On a trip to America in 1918 Innes purchased a set of mechanical components, assembling them into a chassis in Detroit and then, with just a temporary seat, drove to California where the car was shipped home.⁴ On arrival in Sydney Innes constructed a body for the chassis and by September 1918 had sold it. A demonstrator Lincoln was then built and several Australian firms were contracted to supply local parts including T McCulloch & Co (pattern makers), Pioneer Springs, Australian Steel Castings, Malleable Castings and F G Kerr & Co.⁵

The Lincoln was announced in February 1919 at £525. Production was set back however, following a factory fire on 18 June 1919.⁶ Innes persevered, establishing a factory behind the gutted one at 7 Randle Street, Sydney. The demonstrator had been saved along with three sets of components that were quickly assembled and sold. A shipment of 25 sets of imported parts arrived on 31 July and more were scheduled three weeks later. The specification included a Continental six engine rated at 25.3hp, Detroit Gear & Machine Company transmission, Genner steering and Autolite electrics.⁷ January 1920 also saw a tourer, roadster and chassis exhibited at the Sydney Motor Show.⁸ (Figs. 5.1 & 5.2)

Some standard Lincoln Six cars (up to May 1923) used the locally designed Acme 6-spring suspension costing £25. After May 1923 Innes introduced a modified Australian Six chassis, used mostly on the 7-passenger model and installed his own designed suspension setup, using a unique four-cantilever spring system, called the special Lincoln springing, at an additional cost of £25.⁹ Innes promoted his suspension by running road tests through Sydney's worst streets, the ride, He claimed, had Lincoln

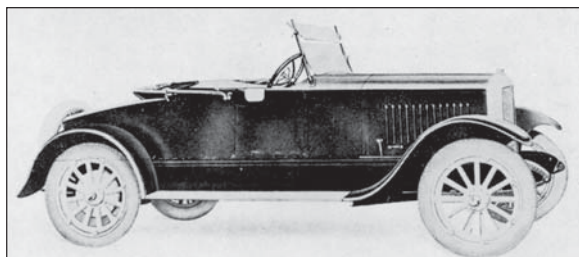


Fig. 5.1
The Lincoln Six Roadster from the
company sales catalogue

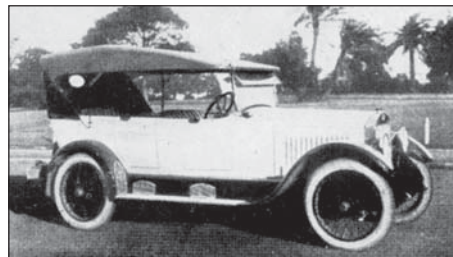


Fig. 5.2
The Lincoln Six Tourer.
The Australian Motorist Advert. Nov. 1922

owners rushing their cars back to the works to be fitted with the new springs.¹⁰ The spring system was lodged with the Patent's office, but a patent was never issued. (Fig. 5.3) In 1923 the Lincoln Six, available on a 122" wheelbase with three Australian designed bodies, a 2-passenger roadster, 5-passenger touring and 7-passenger touring was priced from £590, an increase of £65. In compensation customers received a re-styled all-steel body with Queensland maple timber framework, full domed fenders, leather upholstery and a full tool kit.¹¹ Innes used his own designed honeycomb copper radiator that he claimed to be boil proof, adding at the launch that the name Lincoln came from the support he received from the American component manufacturers.¹² It was also planned to export the Lincoln as it had been demonstrated in Java and the Straights Settlements on the trip from the USA in 1918. The first recorded orders for an Australian car were exported to Java.¹³

By mid-1924 Lincoln Six sales were drying up, which coupled with an extended law suit from the Ford Motor Company over the use of the Lincoln name, had caused money to flow out rapidly. Innes ceased his role in the company at the end of 1923 with a new investor purchasing the firm in early 1924. The last car was produced in 1926 and in the end the lawsuit was dismissed. It was too late for the Lincoln.

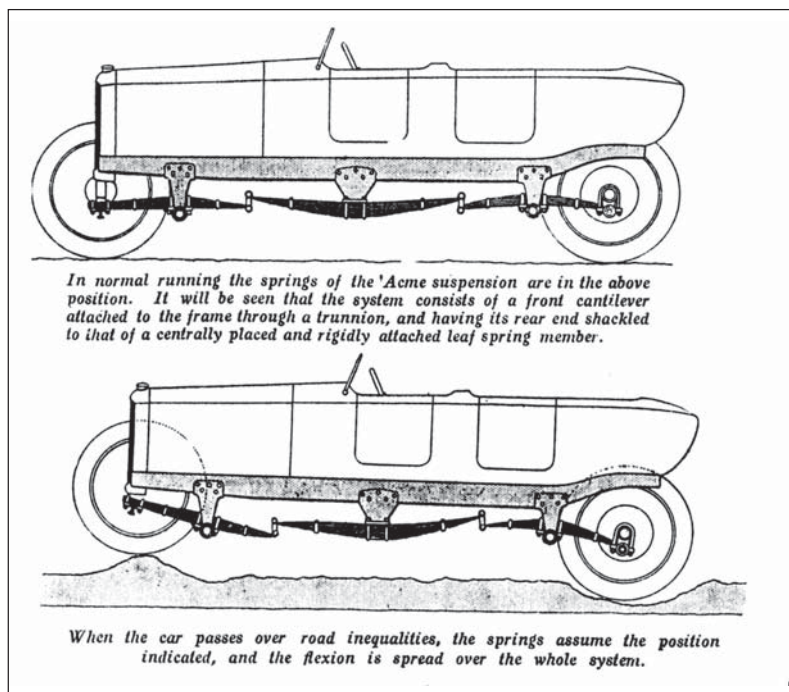


Fig. 5.3

The Fredriksen suspension system showing how the interconnected springs reacted to bumps.

The Australian Motorist

Australian Six

The second car in this pre-Holden period, the Australian Six, is perhaps the best known, as several authors have published on the topic.¹⁴ Produced between 1919 and 1926 by a series of companies, commencing with F H Gordon & Company Ltd of Sydney, the Australian Six was the creation of Frederick Hugh Gordon, the son of a Scottish immigrant who started his motor interests by importing the first two Ford cars into Australia in 1904.¹⁵ Gordon then managed Motories Ltd, importing and selling S.C.A.T., B.S.A. and Métallurgique cars in 1908 and by 1910 had added Packard, Mercedes and in 1914 Hupmobile.¹⁶ At this time W J C Elliot took over Motories Ltd and Gordon formed F H Gordon & Company. On 13 June 1918 the firm was registered as F H Gordon and Co. Ltd with shareholders including the Mitchell brothers, Robert and Eustice, A N Dunn, A L Holt and J J Dennis.¹⁷

Pedr Davis suggests Gordon visited the American Motors Corporation factory in Detroit and saw the American Six car that had been designed from component parts by Louis Chevrolet, the company's chief engineer.¹⁸ Gordon had already gained experience in auto production by importing and part-assembling the Wolseley designed Stellite 4-cylinder car in 1914 and was well known as a sales agent for the American Mitchell car.¹⁹ Gordon went to America in late 1918 when he ordered two Model B American Six chassis, one complete with a radiator and the other as a complete set of components, disassembled. On arrival in Australia local touring bodies were fitted, and these became Gordon's prototypes, both surviving, one in the National Museum of Australia (chassis no. B767).

Gordon signed an agreement with American Motors, ordering around 49 sets of touring car components to be shipped to Australia. Many publications incorrectly suggest this first order was for complete cars, the only difference being the addition of an Australian Six radiator badge. In February 1919 Gordon announced he was going to build the Australian Six. John Cook believes Gordon dummied up an Australian Six car to run at a Victoria Park (Sydney) motor race meeting the same month as his demonstrators were not ready. The event did not happen as an influenza outbreak saw public events cancelled. At a rescheduled event in April the first assembled chassis was run successfully.²⁰

The initial specification of the Australian Six has a number of changes compared to the American Motors chassis. For example the engine was a standard (model 25) 45hp 230ci Rutenber engine with 3½-inch bore x 5-inch stroke rather than the Special Rutenber American Six engine, the transmission was changed to a Muncie rather than a Grant Lees, the rear axle was a Columbia unit not a Salisbury, and the radiator shell was from the American Six with an Australian Six badge.²¹ (Fig. 5.4) The cars were converted to right hand drive (RHD), the rolling chassis was assembled at Rushcutters Bay, then local body builders fitted the body. A story of converting to RHD by simply turning over the steering assembly, a consequence being the oil filler plug was underneath the steering box, only relates to the two-prototype chassis.²² It has also been incorrectly suggested the first Australian Sixes were CKD Mitchell cars assembled by Gordon. This confusion possibly arose as Gordon had landed a shipment of Mitchell cars in Sydney around August 1918.²³

My research indicates Gordon had completed about 12 cars by the end of 1919 suggesting he was building vehicles to order. In November 1919 Gordon lost an unrelated court case, effectively bankrupting him. At this time the directors of F H Gordon & Company Ltd sought to raise additional funds, subsequently admitting R N and F Wallis to the Board. Gordon attempted to preclude the new shareholding, and the resulting injunction against him was upheld by the court. At this point the directors of F H Gordon and Co Ltd decided to reorganise, forming Australian Motors Ltd, and taking over all the assets of F H Gordon and Company Ltd while excluded Gordon and the Mitchell brothers. The reorganisation took in shipbuilders and engineers, David Martin as Engineering Director, Jack Hughes as the plant Managing Director, and the remaining shareholders

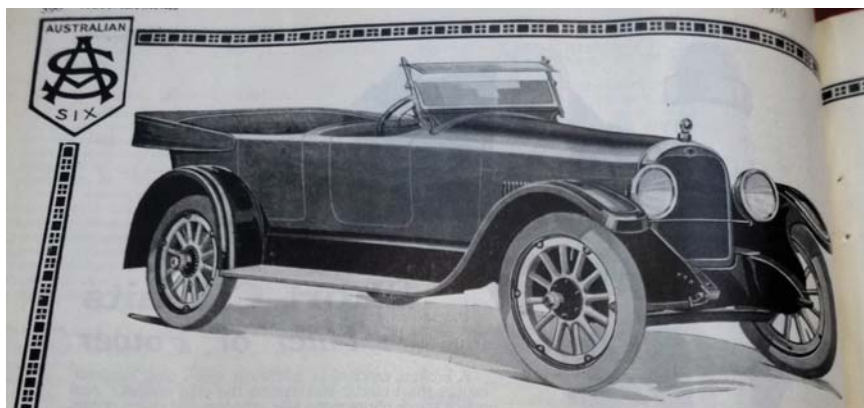


Fig. 5.4
1919 Australian Six
Touring Car with the
American Six “rounded”
style radiator.

**Company advertising -
The Motor in Australia,
Nov 1919**

were A L Holt, J J Dennis, R N Wallis and F Wallis.²⁴ For a short time Gordon, as F H Gordon & Company Ltd, continued as sales agents at the Sydney central office, advertising the cars under F H Gordon and Company.

Hughes and Martin had become involved with the Australian Six project in 1919, were advocates of a different marketing strategy and set about constructing a large factory in Parramatta road, Ashfield, completing it in February 1920. David Martin went to America and organised the purchase of mechanicals. A major change was replacing the American Six rounded radiator with a locally made Grecian style unit with a new style badge. At the time of asset transfer there were some rounded radiator cars under construction, suggesting only 18 to 22 rounded radiator Australian Sixes were built. (Fig. 5.5) Advertising was also changed with full page advertisements appearing in motoring journals through 1920. Initial production was set at 1 car per day. The firm established their own body plant and also produced locally-designed windscreens, bonnets, upholstery and the body framing. Other components like mudguards were outsourced to F Muller & Sons.²⁵

The published Australian Six story also assumes that shortly after production commenced cars were returned with engine failures, lapping compound found in the bearings, and misaligned transmission and engine. The fix involved a strip down and rebuild of all engines and a revised bell housing made by Harkness and Hillier. All of this story is unsupported by evidence. John Cook suspects some engines may have been contaminated but has inspected a number of engines and has so far found no evidence of failures. In the case of misaligned engine-transmissions Cook also points out that the specification of engines, clutches and bell housings was fixed

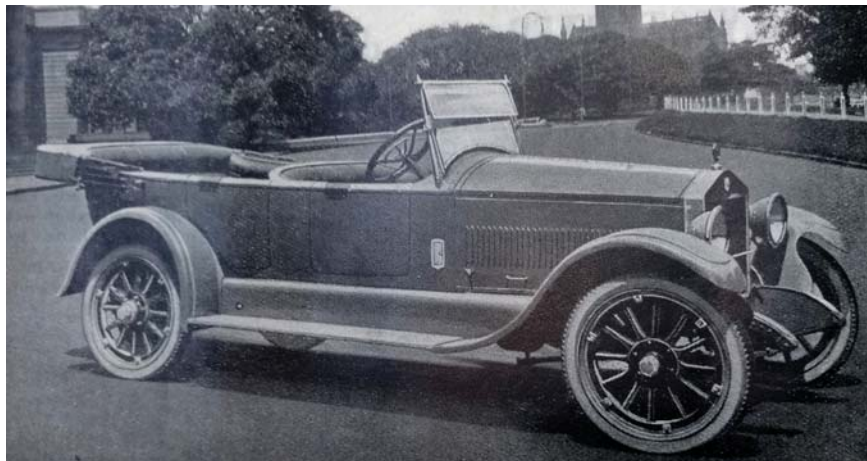


Fig. 5.5
1921 Australian Six De
Luxe Touring Car with
“Grecian” style radiator.
The Australian Motorist

by the Society of Automotive Engineers and no other component assembler had this problem. He suggests the story possibly arose when some Ansted engines were fitted by Harkness & Hillier and this required modification to the bell housing.²⁶

By 1921 the company was in trouble, as stiff competition and falling competitor's pricing made the Australian Six difficult to sell although six were exported to New Zealand in May 1921.²⁷ Several body styles were offered, including a sporty 2-seater aluminium roadster; however, receivers were appointed from 1921 to 1923 they took on the role of manufacturer under Australian Six Motors and Australian Six Sales. As a last attempt to complete the delivered components, the receiver retained Harkness & Hillier to assemble the cars using Propert Body Works bodies. The last 4 cars were completed using Ansted engines. In December 1923 official manufacturing ceased although Harkness & Hillier continued to complete cars into 1924 using refurbished engines. In total about 480 Australian Sixes were built a figure arrived at by Cook by documenting chassis numbers up to 480.²⁸ There is no evidence that 900 or more were produced as frequently claimed.

In the end the Australian Six cost Gordon and his shareholders a considerable amount of money and left Gordon broke, despite the car containing some local Australian content. Company public relations suggests 60-65% local content was achieved but this is on the high side given the cost of landing the mechanical components.²⁹ Innes also claimed the Lincoln Six had a high local content, with 28% imported, but again there is no information on how these numbers were calculated or what they represented.³⁰ In analysing what went wrong with the Australian Six, Cook suggests a change in business plan by the directors led to ultimate failure. When Gordon commenced the company he took orders and built cars, thus assuring sales. The takeover by Australian Six Motors saw production stepped up and cars stockpiled waiting for buyers, inventory costs rose and cash ran out. The Australian Six had failed.

The Summit

The Summit car, the third of the volume post war producers, was built by Sydney firm, Kelly's Motors Ltd, with chairman, Sir Hugh Denison, businessman and proprietor of Sydney Sun Newspaper, heading the

company. The driving force behind the car was William Kelly who set a production of 5 cars per day from August 1923 and planned for the car to be as Australian as possible.³¹

Kelly started in the motor business when he ran a taxi in 1910. A year later he launched the Suburban Taxi Cab Company and then purchased Elliott's Motors in a liquidation sale. With the Elliott Motors acquisition Kelly acquired the New South Wales Chevrolet Agency in 1916, eventually securing the distribution of Chevrolets in New South Wales and Queensland.³² Kelly's backer, Denison, for unknown reasons decided to sell the Chevrolet agency to McIntosh Motors. Kelly then went to work as sales manager for Acme Springs Limited, a firm registered on 4 March 1921 with a capital of £25,000 by Christian Fredriksen. Fredriksen had patented the Acme spring suspension, a system which he designed in Sydney under the name F C Acme Floating Spring Syndicate.

In mid-1921 Kelly and Fredriksen went to England and America with an Australian Six car fitted with the Acme spring set-up. An attempt was made to sell the system that comprised three sets of cantilevered leaf springs each side of the car connected together so that road shocks were distributed across the chassis making for a smoother ride on rough roads.³³ Only one American manufacturer, Gardner, showed any interest in the Acme suspension despite Kelly and Fredriksen showing it all over Detroit, including a demonstration ride with Henry Ford.³⁴ The Lincoln Six offered the same set-up as an option in 1921. Kelly's visit to America had also provided him with the opportunity to see component manufacturers and their products, so when the Acme Springs did not sell he turned to his own car, the Summit.

Priced at £460 the Summit was expensive for a 4-cylinder car fitted with either a locally designed 5-passenger tourer or 2-passenger roadster body. By early 1924 four models were available but essentially the existing styles were fitted with California tops, a slightly revised radiator, additional bonnet flute and revised body styling featuring sharper crease lines. Two colours were available, royal blue with a light blue pin stripe and fawn with a dark brown pin stripe, and the wooden spoked wheels were painted yellow.³⁵ The engine, a 21hp 4-cyl Lycoming was coupled to a Flint transmission and an American 112" wheelbase Gardner chassis. According to Kelly the name Summit "was simply this, that it was the Summit of my ambition to design and market a car of my own".³⁶

THE SUMMIT



The Complete Car.

No car near the "Summit" price can compare with it for quality. This is because the "Summit" factory is in Australia, and thus very large savings are effected in freight and Customs Duty, and by eliminating the huge profits that are added to the cost by American Assemblers to cover their factory costs and provide dividends for their shareholders. By buying a "Summit" all this goes into your pocket. You have only to inspect and try the "Summit" to be convinced of its exceptional merit and wonderful value. You are asked to test the "Summit" and learn from experience that our statements are justified.

BRIEF SPECIFICATIONS

ENGINE—Lycoming 4-cylinder, 21 x 5 (21 h.p. English rating), 5 Bearing Crankshaft, 12 in. Connecting Rods	GEARS—Brown-Lipe, 2 forward and reverse.
CARBURETTOR—Latest Zenith.	DIFFERENTIAL—Spiral bevel, 1 floating back axle.
LIGHTING, STARTING, and IGNITION—Dial.	SPRINGS—Acme patent. Total spring length 9 ft. 6 in.
RADIATOR—Feddors.	WHEELBASE—112 inches.
CLUTCH—Borg & Beck disc large diameter.	TRACK—56 inches.

The skilled, well-informed motorist, on reading this list of "SUMMIT" component parts will be struck by the fact that the parts are the highest grade and that any imported car constructed of the same parts would be considerably higher in price than is asked for the "SUMMIT."

Price 5-Seater **£475**
3-Seater

DOCTORS COUPE AND PERMANENT TOP MODELS, £435.

All Models complete with the following Equipment without extra charge—
Beautifully designed Australian body, nickel finish, spare rim, tyre, and tube, acme springs, bumper bars front and rear, small side lights on mudguards, motor meter, glass wind deflectors on both sides of screen, rain clearer on windshield, eight-day clock, speedometer, cigar lighter, electric light on dash and also in rear compartment, stop light on rear, and nickelled toeplates and rubber mats on footboards.

MAY'S MOTOR WORKS LIMITED

"SUMMIT" DISTRIBUTORS FOR S.A. AND BROKEN HILL.

Offices and Showrooms—
EAST VICTORIA SQ., ADELAIDE.

Country Agents Wanted.

Fig. 5.6.
Summit advertisement for 1923.
The Australian Motorist

May's Motors were appointed agents in Adelaide and the Victorian Summit Motors in Melbourne. (Fig. 5.6) Over two years of production saw 500 packs of components, assembled into Summit cars.³⁷ Kelly purchased the components separately from the American manufacturers, and Summit restorer, Graham Fitzgerald, suggests that there may have been offset pricing between Gardner, Acme and Kelly over the spring system. However, there is no evidence of these transactions and it is unknown what the relationship between Kelly and Acme was after the Summit production commenced.³⁸

Denison had provided financial backing to Kelly in a number of ventures; they were keen followers of horse racing and Denison had even won the 1906 Melbourne Cup with Poseidon. Apart from gambling they appear to have had little in common but perhaps Denison was moved by patriotism to build an Australian car, in any case money was not initially a problem. Kelly soon discovered not all the Summit components he imported were up to standard, for example, a batch of castings were full of blow-holes. He persisted however and drove the east coast of Australia promoting his new car but while well-equipped its high price made it uncompetitive. Similar American makes were up to £150 cheaper and so sales declined. In early 1925 Denison appointed a receiver, a Mr Forest. Forest retained Kelly to sell the remaining stock on commission but in November 1925 Kelly was declared bankrupt, although by the end of 1925 he was running Kelly's Motor Auctions at Circular Quay.³⁹

The Roo

While around 15 other individuals sought to produce an Australian car between 1917 and 1939, only three showed any real design innovation.⁴⁰ The Roo Manufacturing Company announced in February 1918 that they would produce cars near Sydney at the rate of five per week, then after 10-weeks production this would increase to 30 per week. The company planned to produce their own bodies and add-on accessories. Two prototypes had been built in 1917 and these toured the eastern states of Australia in an effort to promote interest.⁴¹ (Fig. 5.7)

The Roo was engineered by William Foulis and his partner, international racing driver and designer, Rupert Jeffkins. A Mr McPhee attended to the sales side and P Gilks did the drafting. Only two cars were completed. A Sydney estate agent, T C Lawson, bankrolled the firm but after three years pulled out and the firm collapsed. Advertising claimed everything in the car was locally made.⁴² The engine, a 1.6 litre 10-20hp horizontally opposed 2-cylinder, had been designed and built by Foulis. The first prototype was fitted with a roadster body and the second, a 2-seater Raceabout Roo, was to be priced at £175.⁴³ (Figs. 5.8) The Raceabout was painted bright yellow

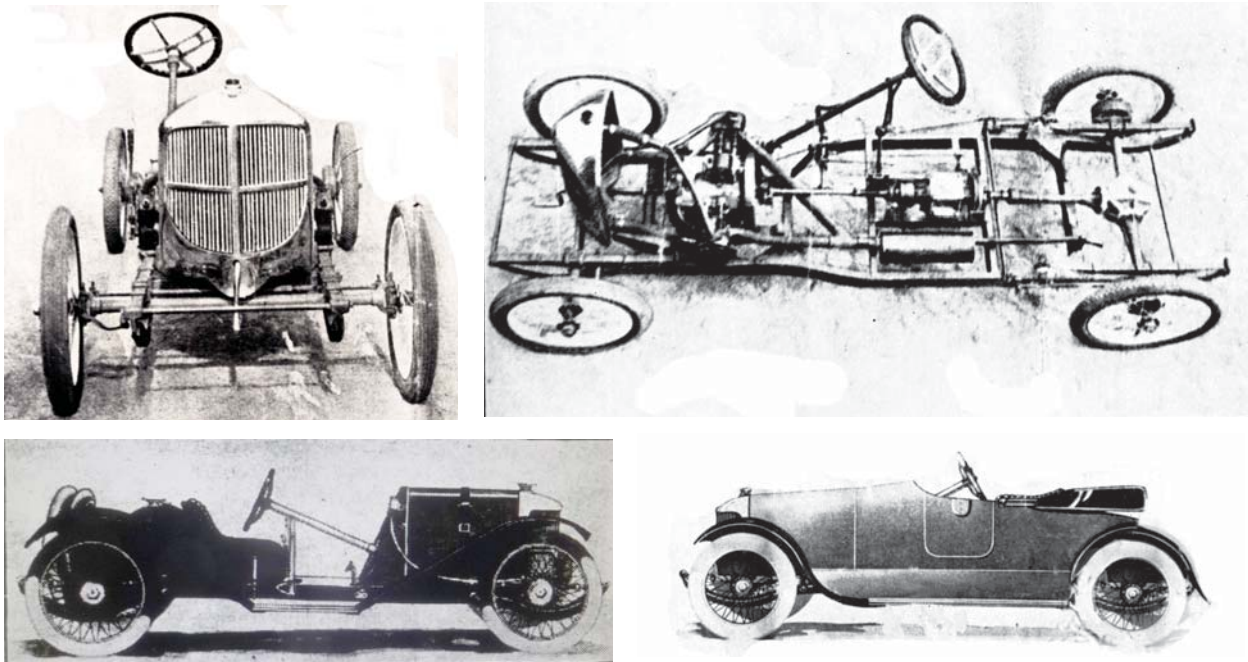


Fig. 5.7 Top. The Roo car from published specification sheet. **The Australian Motorist**

Fig. 5.8 Above. The Roo Raceabout.
Roo company published specification

Above right. The Roo Convertible Cabriolet.
The Australian Motorist

with black fenders and white wheels and was designed along the lines of a speed car by Jeffkins who had applied experience of Indianapolis and other American racetracks.⁴⁴ A better equipped model called a convertible cabriolet was also planned with a roadster body and £195 price tag. Jeffkins made another attempt at an Australian car in 1930. (see page 137)

Marks-Moir cars

One of the more innovative designs made an appearance in three different cars. Dr Arthur Marks, a Sydney dentist, and William Moir designed a chassis-less vehicle in 1923. The pair used a stressed plywood body structure providing a very strong unit for the east-west 4-cylinder engine, located under the front seat and a separate epicycle 2-speed transmission (like the T Ford transmission) with a further 2-speed, sliding gear box that provided 4-forward gears; twin chains drove the rear wheels using a novel solid rear axle:

The ordinary type differential would be a hindrance (when pulling a car out of sand), so at each end of the solid rear axle a worm is cut, the worm drives two small wheels held to the wheel hubs, (they) are formed with a cam at one side. When the drive comes on the cams are first moved against the stop, then both wheels move as though on a solid axle. On a corner, however, the worm wheels move relatively to the worm, thus giving a differential action.⁴⁵

This description indicates the Marks-Moir car had an early lock-up Limited Slip Differential, something not commonly used until the 1960s in passenger cars.⁴⁶ In March 1923 Marks-Moir Motors Ltd was registered with £30,000 capital by Marks and Moir, with R L Houston, A Crago and S W H Hume directors.⁴⁷ The Marks-Moir prototype was built in the United Kingdom by Saunders & Son (later Saunders-Roe), flying boat constructors, and shipped to Australia where a further two or three cars were then built in Strathfield, Sydney. The Marks-Moir car used a 11.9hp 4-cylinder engine (possibly an English Dorman). Marks had been a keen motorist since cars first entered New South Wales and was a director of Motories, a Sydney motor house. The design was so different that it was labelled a freak by the press who also suggested thousands of orders were being taken.⁴⁸ Moir patented his body design in 1927 (no. 6306 *Improvements in and related the manufacture of bodies for motor road vehicles and the like*). (Fig. 5.9)

It was not until 1926 that the vehicle went on public display at the Sydney Royal Easter Show with a suggested price of less than £200. The vehicle was also driven to country towns to promote not only sales but capital raising. At this time James Stormonth, a Scottish engineer, joined the project, announcing changes to the manufacturing process and some design revisions. (Fig. 5.10) In 1928 Stormonth was recorded as having control of the Marks-Moir patent, announcing he was registering the Stormon Car Construction Co Ltd to build the Stormon car on a 10-acre site at Granville.⁴⁹ Registration took place on 8 March 1929 with a capital of £50,000. Three experimental Stormon cars, 2-seater roadsters, were produced and covered “many thousands of miles over some of the roughest roads in Australia, under all sorts of weather conditions, without the slightest effect on the body”.⁵⁰ The engines were British and Stormon made application to import them in quantity.

In 1930 the Marks-Moir design was again resurrected, without Storman,⁵¹ with an announcement that the car would be on Australian roads in a short time.⁵² Moir and Marks’s son, James Marks, drove a fourth version of the car to Canberra in May to meet politicians. Moir had also redesigned the front suspension of the car, using a novel cantilever spring with small spring radius rods and a three-piece front axle.⁵³ The new venture also employed Rupert Jeffkins (Roo car) as an engineer. Jeffkins appears to have brought to the project an expanded 4-cylinder 19.9hp horizontally-opposed engine, similar to the engine used on the Roo car. The new company, Marks Motor Construction Co Ltd, announced the majority of the car would be Australian design.⁵⁴ In 1933 Sir Charles Kingsford Smith joined the company as Chairman and the car became the Southern Cross. By March 1934 orders for 150 cars were in hand and the company expected to build 2,500 per annum, though they were yet to arrange a factory.⁵⁵ (Figs. 5.11 & 5.12)

The Southern Cross was described as a “laminated wood body constructed on the same principal as wing spars, propellers, etc of many aeroplanes”.⁵⁶ The body was built using 10 sheets of Queensland pine and walnut glued with a casein glue that was impervious to moisture. Pressed at 80-tons per square inch over a mould, each sheet was separately glued providing a 1⅛-inch shell that was said to be 16-times stronger than a conventional chassis. Following removal from the mould two bulkheads were added and the doors cut out, hinged and bolted back. Steel cross members carried the engine and transmission, now conventionally mounted with a 2.95:1

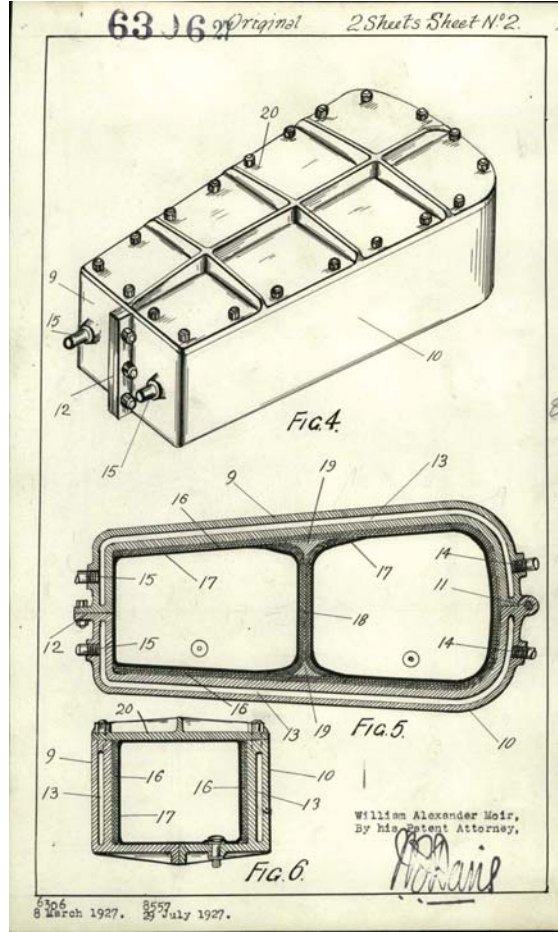
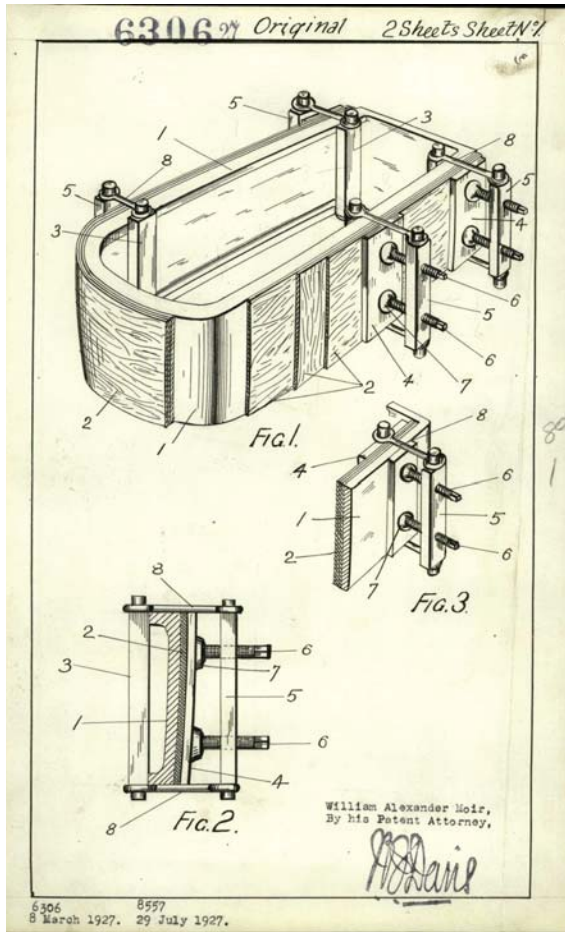


Fig. 5.9 Drawings from the Moir's patent for the construction of a ply integrated motor body.

Australian Patent Office

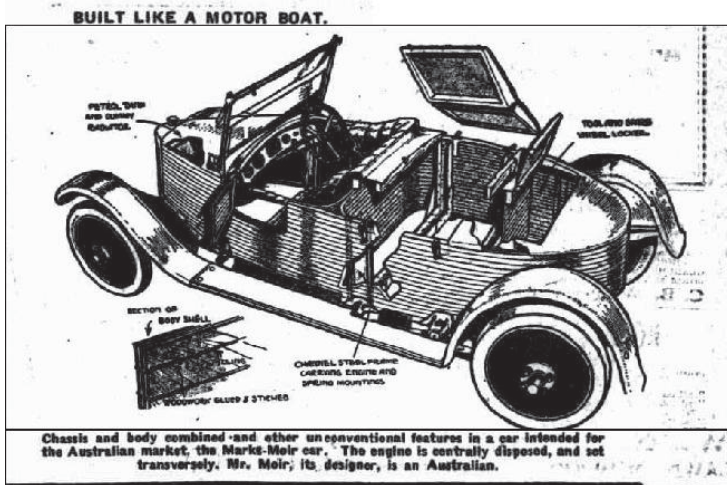


Fig. 5.10
Marks-Moir car structure based round sheets of ply glued together.
The Mail (Adelaide)

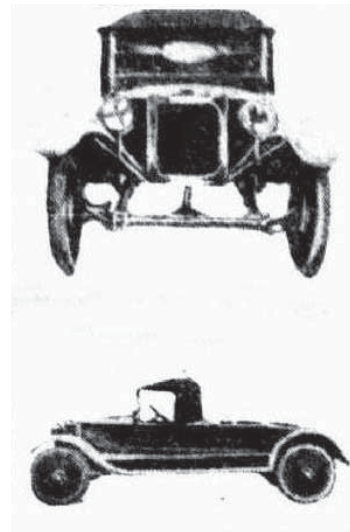


Fig. 5.11
Marks-Moir prototype car.
Herald (Melbourne) 4 August 1924

overdrive, while clamps were used to attach the rear semi-elliptic springs to a normal 4.3:1 ratio rear axle.⁵⁷ The composite wooden body was then covered in a skin of aluminium.

Using the unitary construction theory developed by Marks and Moir, the Southern Cross was produced as a tourer and Airline sedan and was expected to sell at less than £300. At least two of each type were produced before the project was wound up in late 1935. Marks had hoped to produce 220 cars per month and expected a top speed of 70-80mph by using the overdrive, which was described as a special feature of the car.⁵⁸ The disappearance of Kingsford Smith on a flight from England to Australia in November 1935 ended any hope the company had of producing a true Australian car with unique design features. Towards the end of 1935 the firm still had no factory. An inspection of the Lithgow small arms establishment in October made shortly after this disclosed that the Southern Cross was in difficulty.⁵⁹

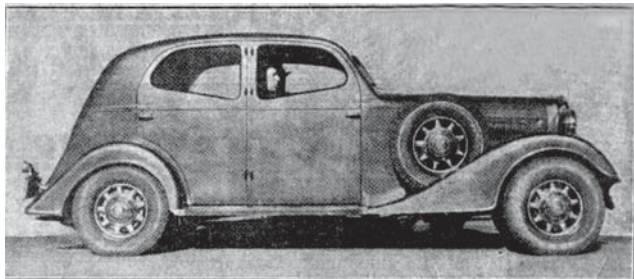
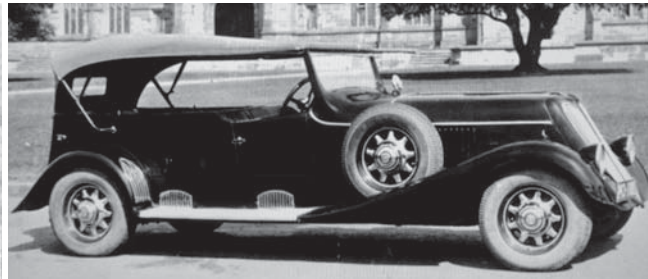


Fig. 5.12
Southern Cross sedan.
Pedr Davis



Southern Cross touring car.
Pedr Davis

The Eco car

One of Australia's unsung early engineering designers was George Hamilton-Grapes who was born in Dublin, spent his early years in England as an automobile engineer before migrating to New Zealand around 1896. Hamilton-Grapes arrived in Melbourne in 1914 representing the Albion Truck company under Austral Motors Melbourne.⁶⁰

In 1919 he embarked on a plan to produce a complete car, one designed for Australian and New Zealand conditions and based on his forty years of motoring experience. Recognising that no Australian manufacturers could produce the mechanical components, he went to Detroit in July 1919, spending 12 months producing a sample car he named the Eco.⁶¹ The Eco design was based on a modified Lycoming 10hp 4-cylinder engine of 3³/₈-

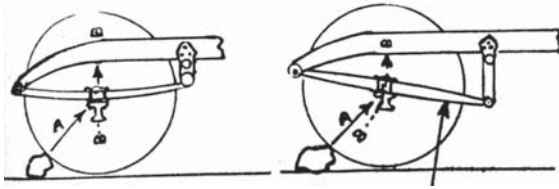


Fig. 5.13

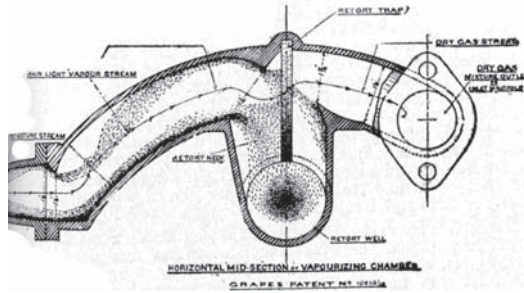
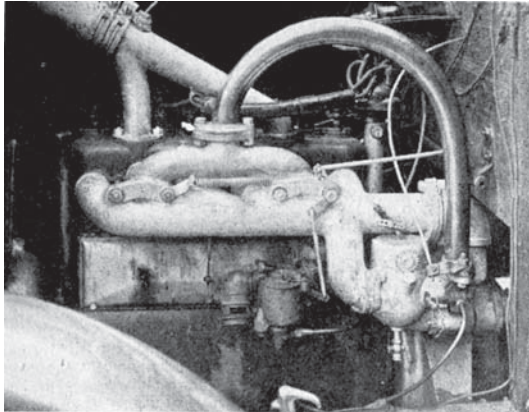


Fig. 5.16

Above. Hamilton-Grapes patent Eco Atac gasifier system.

US Patent Office

Fig. 5.14. Top. Eco manifold showing the vapourising chamber.

The Australian Motorist

Fig. 5.15 Above left. Eco car engine showing the Zenith carburettor and manifold set-up.

The Australian Motorist

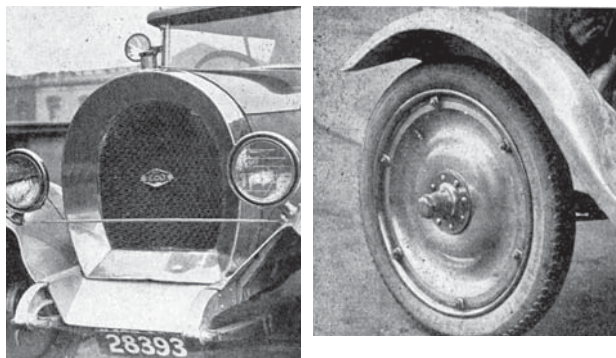
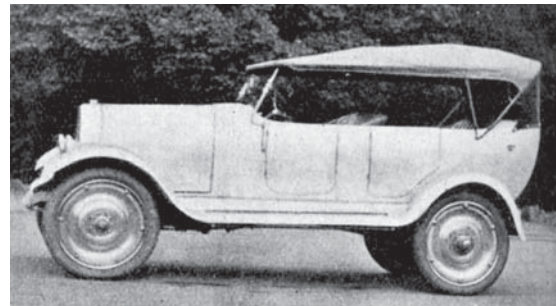
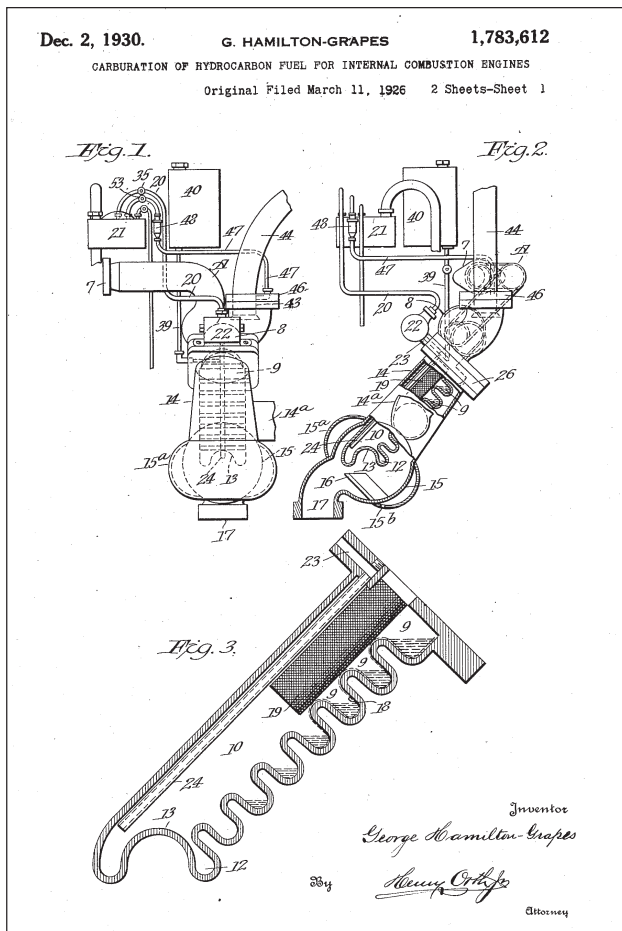


Fig. 5.17 The Eco touring car featured unique designed grille and radiator and spun disc alloy wheels.

The Australian Motorist

inch bore x 5-inch stroke producing 40 bhp and fitted to a 2050lb chassis of Hamilton-Grapes design. Working with the Zenith carburettor company, Hamilton-Grapes designed and built a gasifier that under test conditions at Zenith produced 41.9 mpg (British Imperial gallons) it was patented in 1926.

Other design features of the Eco were patented machined and polished aluminium alloy disc wheels that were very light. Small fins were attached to the inside to dissipate heat. Aluminium was also used on mudguards and running boards. The patented suspension was redesigned with semi-ecliptic (front) and full cantilever (rear) springs, specifically anchored to provide a slight recession on hitting a bump. The first drawing shows a normal spring and the second an Eco Spring. (Fig. 5.13) The final design innovation, also patented, was a forced-draught tropical radiator with a true honeycomb core, polished alloy cowl and 4-blade fan.⁶²

On 6 May 1921 the Eco sample car set out for California, covering 4,000 miles before being shipped to New Zealand then Australia. Hamilton-Grapes spent 12 months further developing the Eco and in late 1922 established Eco Motors Co. Ltd with a factory planned at Oakleigh, Victoria. It was announced the new firm would produce 300 touring cars per annum.⁶³ The production model had several changes, the Lycoming 4-cylinder was updated to a 19.6hp with 3½-inch bore and 5-inch stroke developing 40 bhp and the chassis lengthened to 111 inches. The Eco gasifier was now called an Atac (automatic thermal auxiliary carburettor) that essentially vaporised the fuel, boiling the kerosene @ 430°F in a retort and thus providing a highly volatile mixture that was thrown into the manifold by centrifugal action.⁶⁴ (Figs. 5.14 & 5.15) The car was also tested by engineer Professor W H Kernot at the University of Melbourne who found the Eco economy claims were within 2% of the actual economy, 52.8 mpg (flat roads at a constant speed).⁶⁵ Hamilton-Grapes Company commenced production in March 1924, advertising it would start on petrol but consume exclusively kerosene at 35mpg. An initial order bank of 50 cars, either to be finished as deluxe tourers or standard tourers or a chassis costing £375, was established.⁶⁶ No sooner had Eco commenced production than it all ended. Two cars were finished in Eco cream with a South Australian body. (Fig. 5.17) The company was formally wound up in May 1925. Hamilton-Grapes continued to develop his carburettor system, re-lodging a patent application in 1937. During the WWII fuel shortage his invention was discussed as a possible solution, but nothing came of it.⁶⁷

The Besst car

The Besst car was organised by May's Motor Works Ltd of Victoria Square, Adelaide. George May had been in partnership with Albert Cheney selling first Dodge and then by 1916 the Chevrolet, Humber, Wolseley and Stellite.⁶⁸

In 1919 May took both an Australian Six and later a Summit agency and was perhaps encouraged to produce his own car. It is also likely he imported the Stellite car in knocked down form, as did Fred Gordon, and gained assembly experience. The Besst parts were sourced in America and featured a 3.2 litre 4-cylinder 19.6hp Lycoming engine, Muncie 3-speed transmission and 116-inch wheel base Crowe-Elkhart chassis.⁶⁹ Available at £450 in 5-passenger touring form, with a King of the Road body built by T J Richards was overpriced; in comparison the Chevrolet was just £220. Only five Besst cars were produced. May had announced the Besst car in January 1925 but by October 1925 May gave up both the Besst and Summit cars, offering his demonstrators at a greatly reduced price (Besst) and half-price (Summit).⁷⁰(Fig. 5.18)

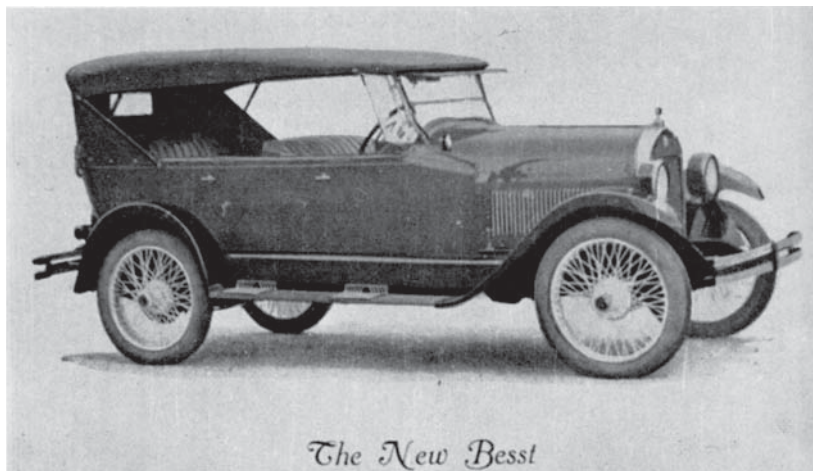


Fig. 5.18
The Besst touring car.
Besst sale's catalogue

The Chic car

The Chic car was conceived and part designed by Clarence Chick of Currie Street Adelaide in 1923. Chick had two chassis with a 2.1 litre 14/40hp 4-cylinder Meadows engine and a second fitted with a 2.7 litre 18/48hp 6-cylinder Meadows engine. The advertising suggested the car was “an engineering masterpiece”.⁷¹ Chic, a motor mechanic and proprietor of Clarence Park Engineering and motor works of Adelaide went on a world trip in 1922 to investigate motor car manufacturing. In London he met

Henry Meadows, entering an agreement for the Meadows engine company to provide an engine designed by J H Dorman, for his proposed Chic car.⁷² (Fig. 5.19) Meadows was to assemble a rolling chassis made by F W Bond and Company of Thorncliffe, Yorkshire. Bond in turn had Rubery Owen build the chassis rails, fitted a 15-30hp Meadows engine and sent it to Australia. Chic is reported as saying he should have used the 6-cylinder engine in all his cars.⁷³

In December 1923 Chic Cars Limited, with Sir Richard Butler, C Wade, T F Dollard and W C Chick as directors was registered.⁷⁴ Using components sourced mainly from England with a few locally made (body, radiator and bonnet) 50 cars, tourers and roadsters, were produced up to 1926. (Fig. 5.20) A 4-cylinder Chic sold at £485. In 1926 Chic and others formed Olympia Motors Ltd that acquired all assets and rights of Chic Cars.⁷⁵

The Wege car

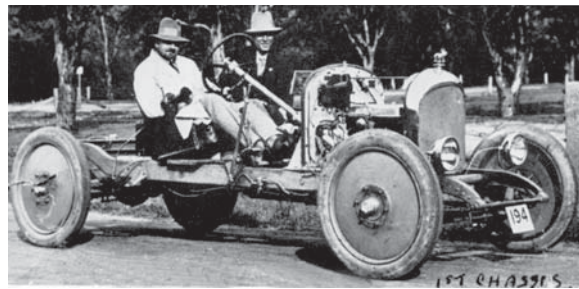
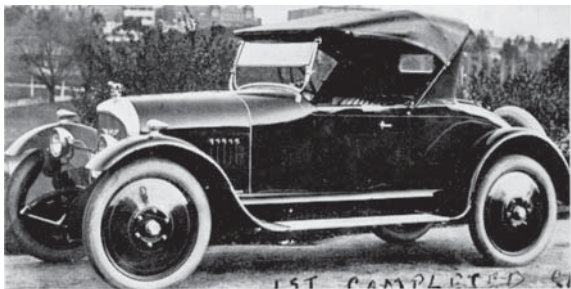


Fig. 5.19

Above. The Chic chassis. This photograph is possibly the prototype unit produced by Bond Cars in England and then shipped to Australia. Chic is seated next to the driver.

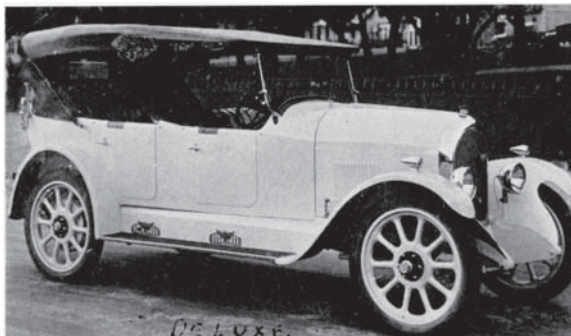
Hoffmann Archive

Fig. 5.20

Above left. Chic roadster.

Left. Chic De Luxe touring car.

Hoffmann Archive



In 1921 Peterborough residents, William Wege and Charles Deland patented a 3-cylinder 2-stroke 1659cc valveless engine rated at 10hp and developing 22.75bhp at 2,000rpm.⁷⁶ An Adelaide based firm, Wege Motor Ltd, was registered in September 1922, operating at 22 Currie Street, Adelaide. Wege began to develop his 2-stroke engine around 1910 after watching a 2-cylinder paddle boat steam engine running. His idea involved stepped pistons with the upper piston acting as a pump with a transfer port that fed the next chamber, number one fed number two with mixture,

then two fed three and three fed one. There were no valves, camshaft or associated valve gear. This was a forced induction engine.⁷⁷ (Fig. 5.21)

Wege travelled to Dumfries, Scotland to gain experience in manufacturing the engine at the Arrol-Johnston factory.⁷⁸ Arrol-Johnston made several production 3-cylinder engines and one was then fitted to a 2-seater car, built for Wege at GDS, a small engineering firm in Altrincham, Manchester and brought back to Australia in June 1922.⁷⁹ (Figs. 5.22 & 5.23) This was followed by a V-six version that Wege installed in a 2-seater roadster built for testing. Wege also produced three 3-cylinder vertical stationary and marine engines and in 1927 a new company, Wege Motors (Australia) Ltd, acquired the patent rights and set about establishing an engine manufacturing plant in Eagle Farm, Queensland. The Karrier company took up the patent in the United Kingdom, producing a 20-25hp 3-cylinder version, while other manufacturers in America and Germany took patent rights. The company suddenly went into liquidation in June 1928.

Wege continued to drive his prototype, clocking up 400,000 miles in

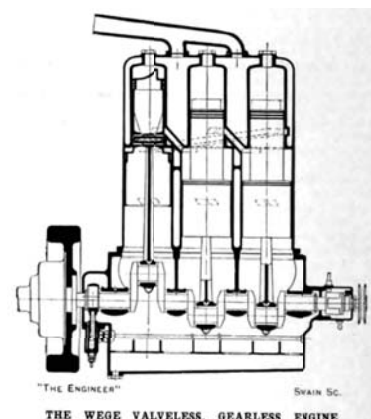
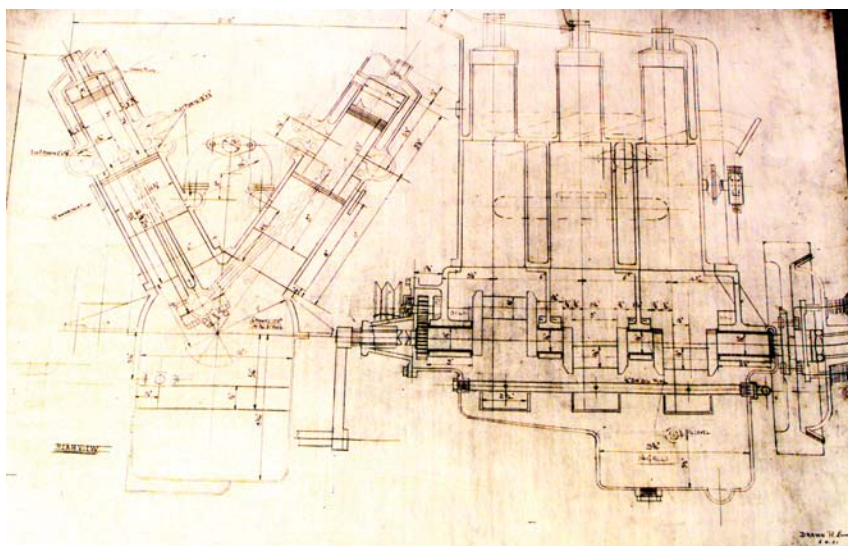
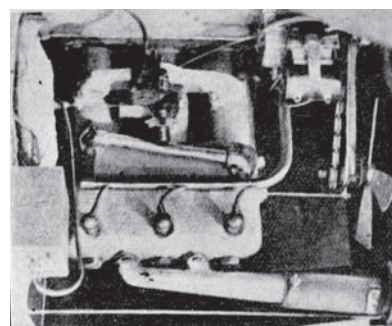
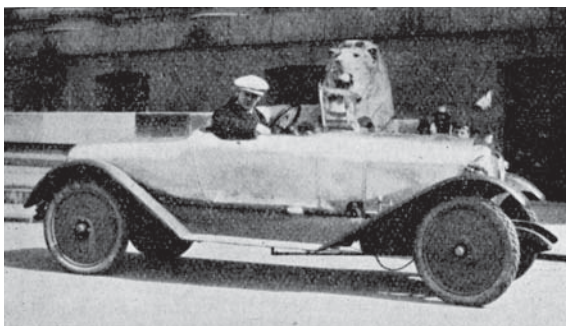


Fig. 5.21
Wege drawings of V6 engine.
Powerhouse Museum
Engine drawing, **The Engineer**



Figs. 5.22 & 5.23

Above. Wege roadster. **The Australian Motorist**

Wege engine compartment.

the 1920s and 1930s. In between 1937 and 1938 when the Australian Government was investigating the possibility of Australian chassis and engine production, Deland attempted to raise the design of the Wege engine, suggesting the Scientific and Industrial Research Department of the Federal Government tested a Wege engine that had been recovered from Western Australia. Deland complained to E J Holloway MHR, that the Wege Motor company's attempts to produce engines in 1925 was met: "by forces of importing interests".⁸⁰ In October 1943 the Army Inventions Directorate wrote to Deland to advise that the "conclusion was reached that active steps towards its manufacture by Government authorities is not warranted in all the circumstances".⁸¹

It was not that the engine was deficient in design, because the testing facility at the Adelaide School of Mines found it was quite effective as a low speed unit. Deland hinted that the design's failure was caused by Wege's personality.⁸² Despite Deland's efforts nothing further came of the Wege engine, although in 1946 Kelly & Lewis Ltd of North Melbourne established K L Tractors to produce an Australian tractor and sought plans and drawings with a view to building a diesel version of the Wege V-six.⁸³

Successes and failures

There are several others who attempted production in the period between 1916 and 1945, including Keep Bros & Wood of Melbourne, Egan of Geelong, (Buckingham), George Bateup, Albani, Australian Automotive Manufacturers Association and Die Casters. These are discussed further in Chapter 8 and Appendix I.

One difficulty facing all Australian producers was the cost of production and investment in new factories. The Australian Six factory at Ashfield was "new and thoroughly modern... a revelation of the wonderful changes that have come over Australia during the past few years,"⁸⁴ and "the plant is said to be the biggest and most modern of its kind in Australasia for the purpose required".⁸⁵ The reality of both the Australian Six and Summit factories was they were labour intensive. There were no assembly lines and it appears little production flow. Photos of the Australia Six plant show separate departments for metal-working, chassis assembly and body building. The images give the impression of many men working on different cars in different stages of assembly, all at the same time.⁸⁶ The Summit was similarly assembled; a short film shows men and women working in an

unorganised jumble of parts and unfinished cars.⁸⁷

Like the pre-1913 producers the post war builders, Foulis, Fredriksen, Kelly, Innes, Gordon and Marks failed despite some progressive designs failed but they produced innovative designs that deserve a place in Australian design history: Foulis (Roo) for an advanced light vehicle with a performance engine, Marks-Moir for a novel chassis-less and innovative car, Fredriksen for a unique suspension and Kelly (Summit), Innes and Gordon for an attempt at mass producing an Australian car and Hamilton-Grapes for a design encompassing several new and novel features.

The Acme Spring suspension system was an innovation that was ideal on Australia's rough roads. However, in Europe and North America roads were paved and cars did not need to smooth out the corrugations and ruts, again there was no market. Innes and Gordon et al came closest to building a sustainable Australian car, but in the end a lack of capital prevented their enterprises surviving the development lead-in time period where start-up problems always appear and require rectification. Why the Marks-Moir car, in all its iterations, failed is open to speculation, but perhaps it was too innovative and the designers had no business acumen. Appointing Kingsford Smith, a hero, as chairman of the board did not mean the lack of business skills was addressed. The reasons for Hamilton-Grapes Eco failure are unclear; it is very likely that insufficient capital was raised among the seven shareholders and the twelve months development period expended the available capital.

Geraldine Lazarus makes the point that lack of capital in the 1920s was critical for the survival of Australian motor car producers and "for small under capitalised Australian companies to enter into the market was probably suicidal".⁸⁸

In addition to a lack of capital, Australian producers battled different component suppliers, inferior parts and high infrastructure costs like spares warehousing, factory manufacturing methods and transportation. The Australian Six, Lincoln Six and Summit cars were produced in limited volumes but compared to the number of vehicles flowing from Ford, Dodge and GM assembly lines the production numbers were inadequate and as a result these Australian cars demanded a much higher price to cover costs. Failure was inevitable and any practical and worthwhile design was lost, consigned to archives and museum basements.

Summary

Australian cars produced between 1917 and 1934 failed commercially for a variety of reasons, a lack of capital being foremost. Despite these commercial failures Australian design innovation, using my working definition, can be shown. These are, Innes (basket weave for motor bodies), Fredriksen (suspension system), Moir (chassis-less car), Hamilton-Grapes (Gasifier carburettor) and Wege (engine). Foulis and Jeffkins can be described as designers as evidence of completed vehicles exists although drawings and patents of their designs do not exist.

Table 5.1 Comparative Data -Aust. and US models

	Year	Price	W/base	Engine	Body styles
Australian Six	1919	£495	122"	23.4hp 6-cylinder	2-pass, 5-pass & 7-pass
	1922	£680	122"	23.4hp 6-cylinder	2-pass, 5-pass & 7-pass
Besst	1919	£450	116"	19.6hp 4-cylinder	5-passenger
Chic	1923		118"	14hp 4-cylinder	5-pass
Chic	1923		118"	18hp 6-cylinder	2-pass
Eco	1922	£535	111"	19hp 4-cylinder	5-pass touring
Lincoln Six	1919	£525	122"	25.3hp 6-cylinder	5-passenger
	1923	£590	122"	27.3hp 6-cylinder	5-passenger
Summit	1923	£460	112"	21hp 4-cylinder	2-pass, 5-pass
	1924	£395	112"	21hp 4-cylinder	2-pass, 5-pass & 2-pass, 5-pass deluxe (+£20)
Southern Cross	1934	£300	120"	19.9hp 4-cylinder	5-pass sedan and tourer
Buick	1922	£785	124"	26hp 6-cylinder	5-pass
Chevrolet 490	1922	£445	103"	21.4hp 4-cylinder	5-pass
Chevrolet F.B.	1922	£595	103"	21.4hp 4-cylinder	5-pass
Ford T	1922	£320	100"	20hp 4-cylinder	5-pass, 2-pass

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Chapter 6: Standardised body development 1917 - 1925

Between 1917 and 1925 the Australian motor body industry evolved from low-volume, craftsman-centred activity to standardised, high-volume production. The body builder's craft is an important part of this story as it fostered early automotive design practices.

Mass production led to increased mechanised plant, principally large panel presses, which changed the way bodies were designed and built. The time-honoured use of timber frames yielded to all-steel bodies. The period was to also witness the entry of three American manufacturers: Ford who established their own facilities at Geelong, GM who made an agreement with HMBB to exclusively produce their requirements at Holden's Woodville plant at the start of the period and Chrysler, who increasingly provided orders to T J Richards until this company was supplying the total Chrysler/Dodge requirements. These three American firms provided the Australian body producers the means by which they became the dominant designers and suppliers of motor bodies in Australia. At the same time the first local design office was established at Holden with a small team. This was Australia's first industrial design studio.

Holden's Motor Body Builders, Limited (HMBB)

Holden Ltd today are able to trace their automotive roots in two ways, the first through the firm Holden & Frost Ltd, which is the accepted company history and the second through the firm F T Hack & Company, a firm never recognized by Holden as having a significant role in the design and production of their first motor bodies. This small body builder is always portrayed as a simple stepping stone for Holden's Motor Body Builders in their quest for production capacity. I argue that the Hack enterprise was a vital component of Holden's early success and without their acquisition Holden may never have achieved their early dominant role.

The accepted history of Holden assumes Holden & Frost were building motor bodies before 1917 a view popularised by Nancy Buttfield's family history¹ that on new evidence can be questioned.²

She records that her grandfather, H J Holden, recognised the impending motor body embargo in 1917 and did not wait for the axe to fall.³ Buttfield contends that Holden went to Melbourne and organised a meeting of motor traders and together they confronted the Government with a proposition to restrict the importation of fully made up cars. Buttfield credits H J Holden with the

quote “one fully made up car for every three chassis imported”. No evidence of Holden’s attendance at these meetings can be found. Holden in early 1917 was an important Adelaide businessman but in terms of motor body building had almost no involvement in the embargo of 1917.⁴

John Holden, a grandson (of H J Holden), gave his father (Edward) the credit for Holden and Frost’s move to body building, telling Sydney Morning Herald reporter, Tony Stephens that:

One morning at breakfast in 1917 dad opened his paper and read a paragraph saying that the Australian Government was placing heavy duties on the importation of motor bodies. He turned to his wife and said ‘this is what I’m after.’⁵

Apart from family histories, on the matter of pre-1917 Holden body production there are three accounts: John Goode’s *Smoke, Smell and Clatter* (1969), Peter Swan’s unpublished thesis (1972) and Frank Daley’s unpublished company history (1962). All three claim that there were three Holden & Frost customers in the period 1916 to 1917, plus deluxe T-Fords and Goulding side cars. (Figs. 6.1 & 6.2) The first body was for a Hotchkiss car in May 1916, then a Maxwell for the Adelaide agent O Ralph in September 1916 and a Rover car for E H McMichael between late 1916 and early 1917. These car bodies were not made by Holden.

Even earlier, in 1914, Frederick Stevenson recorded a Lancia being the first motor car to arrive at the Holden Grenfell Street works. Stevenson, a trimmer, was employed in 1910 to head Holden & Frost’s newly opened motor trim shop that initially made hoods and side curtains. The Lancia was to be re-bodied and Stevenson’s son, who started with Holden & Frost in 1913, recalls the body came from Fredrick Hack’s works. After working on the Lancia, Stevenson suggested Holden build their own bodies, but they thought this crazy and called it Stevenson’s Dream.⁶ It is, therefore, clear Holden & Frost had no desire to build motor bodies in this early period. Stevenson was not so crazy as he developed and patented a method of retaining seat springs, leaving Holden & Frost in 1915 to first manage the Spring Grip manufacture at James Marshall & Co and later establish his own spring works, FRS Ideal Springs Co. Ltd, in Sydney by 1926.⁷ Replacing Stevenson as trimmer was Fredrick Stace who continued in the trimming department until 1935 when he joined the teaching staff at the Woodworkers’ Trade School Adelaide.⁸

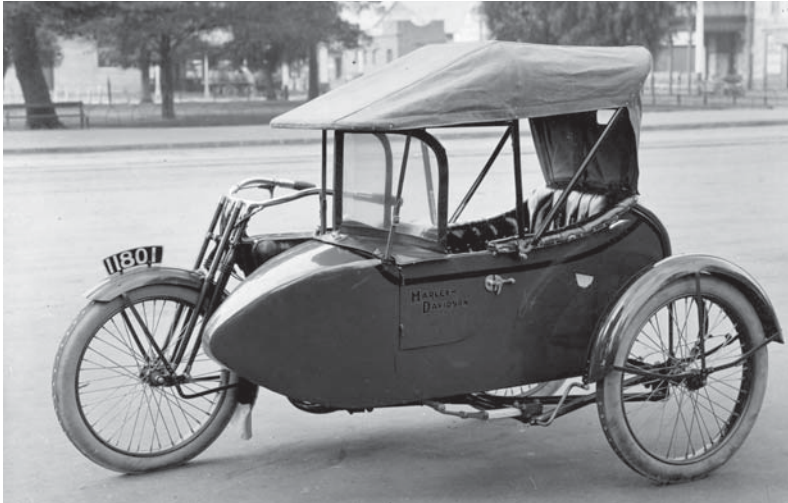


Fig. 6.1
Holden Motor Bodies Goulding side car made for Cornel & Company. The body maker is said to be Holden & Frost employee, George Blomson.
Holden - HMBB

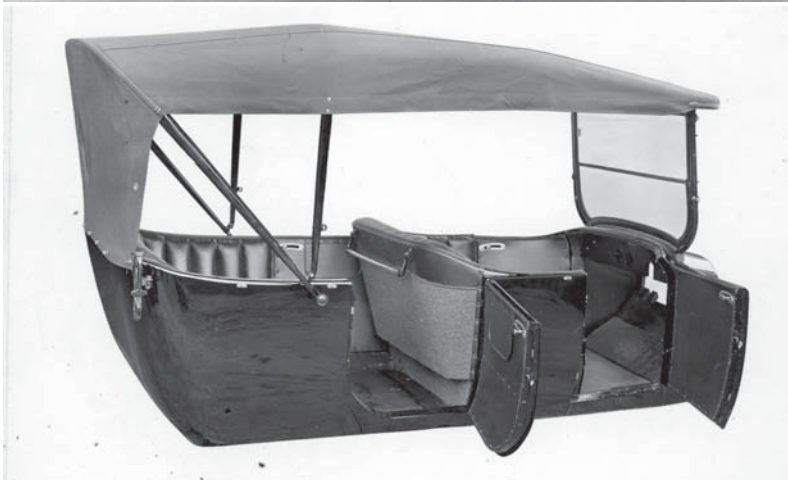


Fig. 6.2
Ford T Deluxe body built by Holden Motor Bodies photo c1921. This body was originally not included in the Dodge/Buick design as F T Hack were building them individually.
Holden - HMBB

The second strong indicator that Holden had no production prior to 1917 is E W Holden's diary, located in the Mortlock Library, of monthly motor body production. This has no record of pre-1917 body production and given Edward Holden's interest in motor vehicles and his post-1917 documentation of production, he would have recorded those early bodies, if they had been produced.

The Holden & Frost operation immediately prior to the embargo was described in a report by *The Mail* (Adelaide) in 1917. The paint shop was located on Grenfell Street with a dust proof varnishing room. Access to the trim department was via an electric 4-ton Sprague lift where buggies, cycle cars and motor bodies were in the process of being trimmed. Next door was a wood mill with specialized saws, planers and sanding machines made by David Shearer & Sons of Mannum. H J Holden is quoted in *The Mail*: "The owners simply bring the old chassis along and we turn them into new cars".⁹ From

the report it is clear the firm did not have any body building machinery. The other employee's names from this early period are Fred Williams, a painter who started in 1916, George Blomson, a coach builder whom Buttfield credits as building the Goulding side cars and a Mr Devine, whom Buttfield claims designed the side cars although she does not disclose when this occurred.¹⁰ These were made for the Adelaide Harley-Davidson agent, Cornel and Company. With respect to the deluxe Ford T Model bodies, Hack held this contract from Tarrant in Melbourne and it appears Holden & Frost were doing the trim, a job that continued through to 1921.

Given this background it is unlikely that H J Holden would have had much influence in the automotive sphere among the likes of Duncan & Fraser, T J Richards or Tarrant Motors, all of whom had large automotive businesses, even then. As H J Holden was actively involved in the Tariff Board Review of 1920 it is possible that these events have led to the family confusion over the events leading up to the 1917 embargo. Holden was the chairman of the South Australian Chamber of Commerce in 1917 and was known to be canvassing the continued importation of motor cars in South Australia as he realised the potential for future repair business.

Clouding the issue of pre-1917 production is a report in the *Australian Motorist* that gives the number of 20 to 25 tailor-made Holden bodies per annum in the 12 months before August 1917. This was more likely F T Hack & Company's production rather than Holden's with Holden doing the trimming, painting and fitting to the chassis.

Albert Cheney was a direct player in the South Australian motor industry, as he was the Vice President of the South Australian Motor Traders Association and a member of the Federal committee of the Association, led by H W Harrison. The motor traders were investigating the issue of a total embargo on motor cars, arguing that the motor car was no longer a luxury since it was an essential tool for transport and farming. Cheney started his career in automobiles with Duncan & Fraser, selling Oldsmobile and Ford. As soon as he had saved sufficient funds he took the agency for the new Dodge in 1913 although it would be 18 months before he saw his first car.¹¹ Cheney was very successful selling Dodges through the Cheney Motor Company and quickly built a business that distributed across South Australia. He records reading a press report in the morning paper of 10 August 1917 that the Federal Government was to ban immediately the importation of motor car bodies. Cheney must have had hawk eyes to spot the one line in a newspaper

item on page 7 of *The Register*, under a heading that declared an embargo on luxury goods – spirits & etc.¹² Cheney did, however, have prior warning of the impending Government decision through his membership of the Motor Traders Committee.

Shocked but not displeased he realised his newly created Dodge distribution enterprise was no longer viable, if he could not instantly organise a locally made body.¹³ By 6.30am he had a plan that was based on the use of a standardised Dodge body for all imported Dodge chassis. He also reckoned the same body would fit the Buick chassis thus increasing volume. Cheney promptly phoned the owner of Pengilly's furniture factory but received a cold response and called young Edward Holden.

Living in Adelaide, Cheney had been acquainted with Henry Holden and his son for some time. He had been impressed with the Holden & Frost attitude to business and their willingness to adapt and he also knew Edward had become active in the firm after graduating from the Adelaide University in 1913. He understood the days of hand building motor bodies in Australia were ending and as he had visited both the Ford and Dodge overseas plants, he knew that mass production techniques were the only solution to cheaper motor bodies.

It is unclear why Cheney did not approach one of the existing body builders, T J Richards, Duncan & Fraser or F T Hack & Co directly. All had the capacity to meet his initial needs but I speculate that Cheney saw a huge demand for automobiles and he believed the existing producers would not meet future requirements. Hack's position will be discussed below.

Cheney does discuss the Dodge distributors in the eastern states regarding their capacity to build bodies. Dalgety held the distribution in Queensland and New South Wales and Canada Cycle and Motor Company held it in Victoria, but Cheney did not believe they would act; it is clear he believed South Australia could swing it.¹⁴ In 1917, 2,300 Dodges were landed in Australia and he recorded:

I had picked up a good deal of knowledge about carriage-building craftsmanship, and had seen quite a lot of mass production methods when in America. Now I saw the possibilities of making motor bodies in Australia; and further, of making them cheaply.¹⁵

Working on a profit of £5 per body Cheney estimated that £50,000 would be needed as start-up capital and this would return an annual profit of £23,000. These facts were put to the Holdens and they quickly recognised the plan's potential. It is at this point the story blurs again. Cheney records that Holden

immediately set off to see a Mr Shields at the Bank of Adelaide and secured a loan for £50,000. The official company history, however, records that Holden sought the advice of a customer and friend, Tom Parnell. Parnell agreed to introduce Holden's to the South Australian financier, Charles Irwin.¹⁶

With Charles Irwin's financial acumen, the Holdens soon had their own plan. The firm of F T Hack, body builders, were close by and Holden had previously used their services. Holden would have been aware of the factory and facilities, just three years old. On Holden's behalf, solicitor, Gavin Gardner commenced the purchase of F T Hack shares. Holden probably knew Hack's firm was in some difficulty as Hack had left Adelaide for personal reasons leaving the business in his wife's hands. Concurrently, Holden, Cheney and Hack's head body builder, most likely Charles Robinson designed and built a sample Dodge body. (Figs. 6.3 & 6.4) A standardised body was required, one that would meet the objectives of mass production, simplicity of construction and a competitive cost. This was the first recognised attempt to plan, design, cost and build an Australian motor body combining the skills of a salesman (Cheney) engineer (Holden) and craftsman (Hack). Cheney set a completion deadline of 23 August 1917 as a Dodge sales conference in Sydney was scheduled on 25 August and it was realised if the total Dodge body requirements could be built by Holden the cost could be minimised.¹⁷

The Dodge body was shipped to Sydney in time for the conference. Holden went with the body and was left to supervise the installation of it on the chassis overnight. The dealers were impressed with both the quality and the price and agreed to purchase the standardised body. The price was indeed attractive at £57/10/0, whereas the local T Ford body was costing £125 in New South Wales.¹⁸ The cheap price was made possible as Cheney and others had successfully lobbied the Tariff Board to have the bonnet, cowl, dashboard, mudguards and running boards included as part of the chassis rather than being part of the body. Cheney returned to South Australia, showed his agents the Dodge car and recorded: "The sale of Dodge cars in Adelaide almost immediately outstripped Ford".¹⁹

This is a somewhat dramatic statement as it took Holden & Frost until mid-1918 before they were producing a decent volume. By December 1920 the embargo had the desired effect as just 624 cars of the 5,290 had an imported body and the rest 88%, had an Australian body.²⁰ True to Cheney's prediction, Holden and Frost took orders and produced the same body for Buick chassis. (Fig. 6.5) Small modifications were made to enable an Essex body to be

produced by adding external door handles and a higher front door to match the Essex cowl. (Fig. 6.6)

The purchase of the F T Hack shares was completed by 21 September 1917 and Edward Holden commenced the task of reorganising the firm for increased body production. Holden managed to take six Dodge orders in 1917, producing these bodies at a loss of £15 per body. A second order for 20 bodies in the new year reduced the loss to £5 and the third order for 50 bodies broke even. Just two bodies were completed in December 1917 and with the sample body made earlier, gave Holden and Frost a production of three motor bodies for 1917.²¹ Official production does not record the first one as it was not sold but rather disassembled and used as a master pattern for parts, jigs and fixtures. Note HMBB did not officially commence trading until 1920.

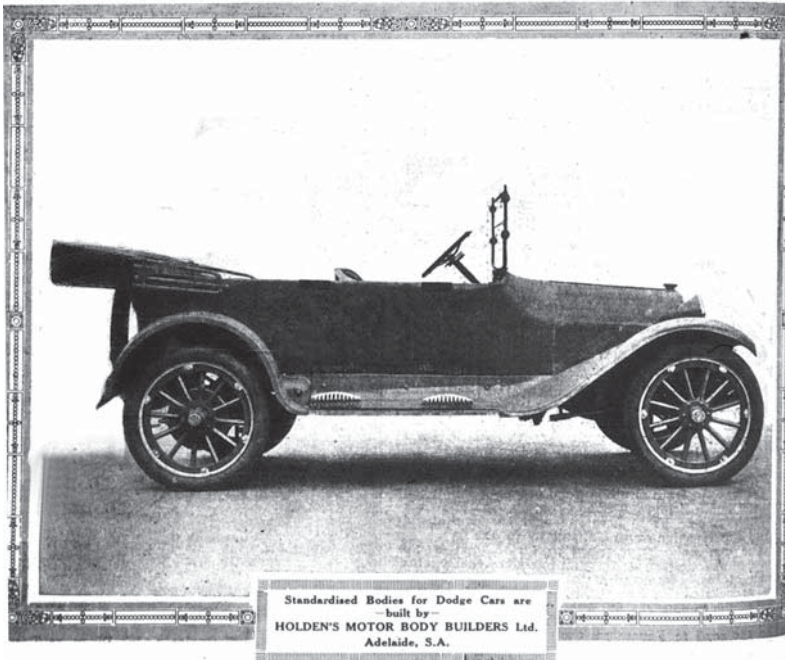


Fig. 6.3
1918 Dodge chassis with Holden Motor Body Builders body. The cowl was part of the imported chassis, thus HMBB only had to match the door to the hinge pillar.

The Australian Motorist - SLV

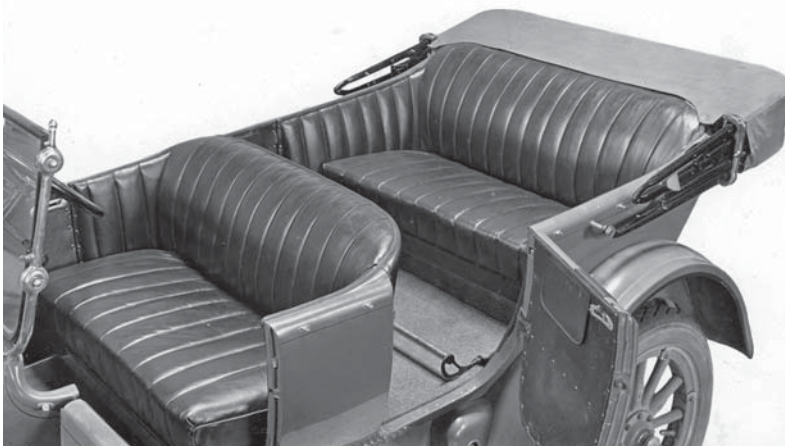


Fig. 6.4
1918 Dodge standard body by Holden Motor Body Builders.

Holden - HMBB

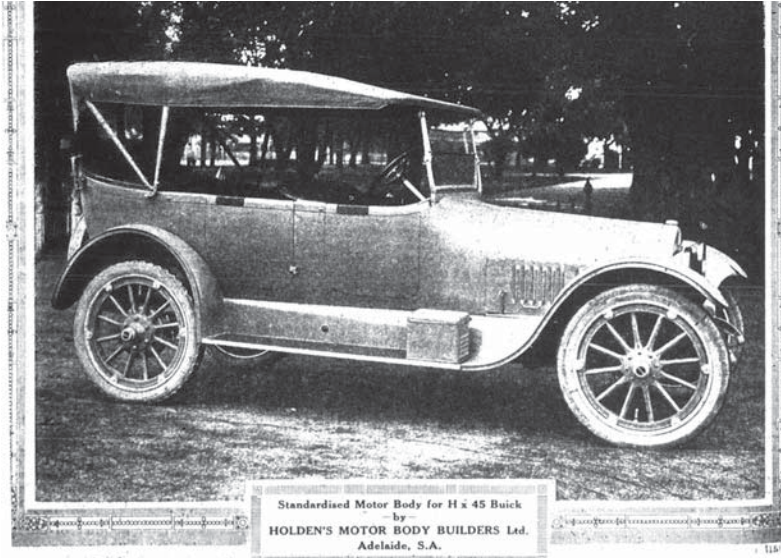


Fig. 6.5
1918 Buick body by Holden Motor Body Builders.
The Australian Motorist

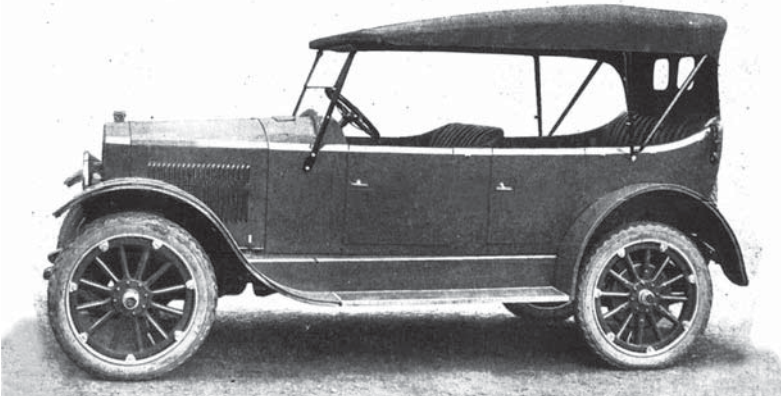


Fig. 6.6
1918 Essex body by Holden Motor Body Builders. Note the higher bonnet flush with the door moulding, Dodge and Buick styling were still reflecting 1912/13 appearance.
The Coach & Motor Body Builder December 1919

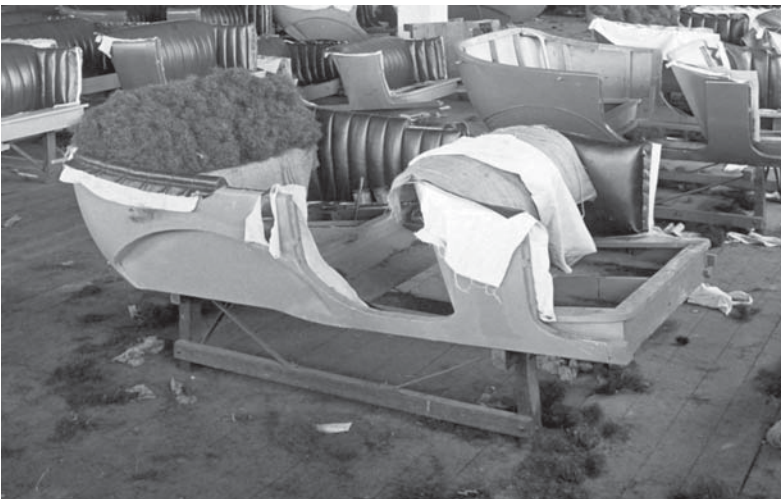


Fig. 6.7
The body produced by HMBB is shown here being trimmed. The body did not include the cowl or valance (curved panel between the bottom of the body and running board). The front door effectively joined the body to the cowl.
Holden - HMBB

The proposed Dodge body only partly met mass production techniques. Small pressings were purchased from iron and tin manufacturer, Simpson & Son Ltd. Alfred Simpson had purchased a double-action press made by American press builder, E Bliss, at the 1878 Paris Exhibition and this provided the pressings.²² Holden's first bodies did not include the cowl, there was no formal assembly line, and bodies were pushed on trolleys. (Fig. 6.7)

The first six bodies were primarily made under the supervision of Robinson, a former employee of F T Hacks. Four were loaded onto horse drawn trolleys and shipped to the Cheney plant in Melbourne via a coastal trader. Holden went to Melbourne and supervised their installation to the Dodge chassis. All were painted Cheney green. Robinson had been paid £7 a week by Hack and Holden increased this to £8. When production reached 20 bodies a week Robinson was paid a £105 bonus. He resigned in 1926 and purchased the Holden Adelaide Body Mounting and Servicing plant in Halifax Street for £13,000, renaming the business C W Robinson & Co.²³ The business continues to operate at the same location as a body repair shop.

One of the hurdles in 1917 was a lack of panel steel. To overcome this, the Customs Director had agreed to establish ways Australian steel producers could start producing strip steel, although in the short term supplies were limited. Holden managed to find a docked ship that carried a hull full of panel steel as ballast and purchased the whole 110 tons. Holden also ordered 20,000 feet of Australian maple, 10,000 yards of hood material and 500 gross of seat springs, materials that would allow a production rate of 500 bodies per month.²⁴

HMBB King William Street plant

Production rose quickly, 587 bodies in 1918 and 1,597 in 1919. The Grenfell site was carrying out the trimming work and the Hack premises undertook the panel forming on the wooden frames. It was quickly comprehended that the body production needed to be consolidated on one site. A block was purchased on the corner of King William Street and Gilles Street Adelaide, in the same block as the Hack building. New buildings were immediately commenced and completed by early 1920. The Holden & Frost Company continued to operate the leather business at Grenfell Street as a separate entity until it was sold to Harris Scarfe Ltd., Adelaide Merchants, in June 1923. The King William Street factory was designed to produce 150 bodies per week, yet it would take two expansions of the works to achieve this number.²⁵

Cheney claimed that Holden had never given him any credit for his role in prompting Holden & Frost to go into body building, a claim that J R Holden could disprove. Cheney also disputed Holden's claim that they built motor bodies prior to 1917. These bodies, Cheney maintained, were produced by a Mr Coyle who rented a shed at the rear of Holden & Frosts Grenfell Street works. Coyle was financed by Cheney who purchased Ford roadster bodies from him. J R Holden organised Ernest Smith, the only employee from the time period, to give his recollection. Smith had been apprenticed in 1916 and remembered that Coyle was the manager of the Minor Body Operations at Holden & Frost. Smith recollected the re-bodying of a Hotchkiss & Maxwell chassis and the production of several Ford roadsters but did not clarify exactly who made the bodies. It would appear Coyle's job was to remove the old body and fit the new Hack built one.²⁶

As the Holden volume grew so did their reputation. Bodies for Buick had been built alongside the Dodge from 1918. By 1920 Holden bodies had been fitted to Oakland, Bean, Essex, Overland, Ford and Chevrolet. In 1920 60% of Australia's body production was in South Australia, undertaken by Holden, Richards, Duncan & Fraser and Bagshaw & Sons, a remarkable achievement.²⁷ The dawn of 1921 saw the Grenfell Street building closed and all activities, including the registered address moved to King William Street. Through 1921 Holden continued to expand, despite a downturn in the economy. The New South Wales firm of Smith & Waddington were at this time in some financial difficulty and were having trouble filling their orders. Holden profited from this and subsequently earned the ire of the New South Wales body builders who lobbied the state government to prevent interstate firms taking their business but this contravened the free trade provisions of the Australian constitution.

Holden bodies were essentially all the same design and fitted Hupmobile, Hudson, Austin and Chalmers chassis in addition to those discussed above. (Figs. 6.8 & 6.9) These makes were just some displayed at a large auto show held in Adelaide in 1921, all proudly showing "Made by Holden Motor Bodies" signage. Again, minor modifications were made to the body design for particular makes, Austin, for example, used a dual cowl and HMBB added this feature to the body.

To compensate for an overall reduction in body production during a 1921 downturn, Holden took on the manufacture of railway carriages for the South Australian Railways and later, W-class trams for Melbourne Metropolitan

Tramways Board (1924) and bus bodies on Mack chassis for the South Australian Tramways Trust (1925).²⁸ The reduction in chassis duty in 1921 had the effect of decreasing new car costs; the resulting increase in sales improved and with it production and Holden had also compensated by running a series of Australia wide advertisements. The only way to produce more bodies was to add employees, but then space became a problem. One solution was to establish assembly plants in Sydney and Melbourne. In late 1919 bodies completed in Adelaide without Duco finish and external hardware were shipped by rail and boat in collapsible crates to interstate assembly plants for final painting, assembly and installation on each chassis. This was all done at a single price (freight averaging).²⁹ In 1921 the works foreman of the Sydney plant, Fred D Williams, employed 120 men, 65 of whom were painters, all using brushes; cars were assembled in sets of eight, 8 Buicks, 8 Chevrolets, 8 Dodges, 8 Overlands and 8 others.³⁰ (Figs. 6.10 & 6.11)

The Melbourne plant was a former factory of lorry builder, D Gordon in William Street, South Melbourne but the factory proved too small for Holden's purpose and was replaced with a building that opened on 15 July 1926.³¹ It is



Fig. 6.8 1921 Chalmers and Hupmobile body by Holden Motor Body Builders.

Holden - HMBB

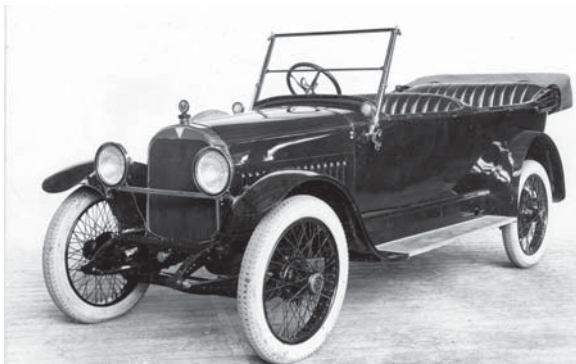


Fig. 6.9 1921 Hudson and dual cowl Austin body by Holden Motor Body Builders.

Holden - HMBB

worthwhile to reproduce here a description of the body assembly plants from 1921:

Although all 'quantity production' motor bodies are constructed at the main works in SA, finishing depots provide for their effective distribution in other states. The bodies, completed except for enamel coatings and other finishing touches, are shipped in huge collapsible crates to the depots, and are then attached to the chassis, and the work thoroughly completed. Thus they are enabled to deliver all cars to the selling agents in absolutely perfect condition. Holdens adopted a selling policy of one price delivered at any capital port in Australia for each individual type of body, irrespective of cost of transport. This policy has received the hearty approval of motor traders, as it enabled the different state agencies for any one type of car to adopt a uniform selling rate in all states, and to keep to a uniform standard throughout.³²

While this sounds progressive, the reality was Holden body production in the early period was not highly mechanised. Advances in mass production were limited to cutting frame and body parts in large quantities all at the same time. There was no assembly line until after 1923 and bodies were assembled in the former piece meal fashion.

In Holden's case the same pattern was used on Dodge, Buick, Ford, Fiat, Overland and Hudson. James Holden said of the process: "The fact that one side of the body might not measure exactly the same as the other to within fairly wide limits did not seem a matter of great importance in the early days".³³ If a panel didn't quite fit it was a matter of: "shaving off a little timber or adding a little metal to make things go-together".³⁴ Jigs were used to build the wooden frame and then the hand rolled panels were screwed or nailed on. Some limited gas welding was performed and screws were hidden by a moulding that had nails embedded in them.³⁵ (Fig. 6.12)



Fig. 6.10 1921 Buick Roadster body by Holden Motor Body Builders.

Holden - HMBB



Fig. 6.11 1921 Morris Roadster body by Holden Motor Body Builders.

Holden - HMBB

The downturn in the economy meant Holden never reached their projected 150 bodies per week although they did manage to record a profit of £41,438 in the twelve months to June 1921. Body production was now running at 73 bodies per week. As 1922 dawned demand outstripped supply. Now, Studebaker, Roston-Hornsby, Durant and Dort as well as a number of British and European makes sported Holden bodies in addition to previous makes. From about 1922 photos indicate HMBB began introducing different sized bodies to suit smaller chassis like Fiat and Rover. A two-seater style or roadster body was added and produced for several makes including Dodge, Buick and Morris.

On 6 March 1922 Charles Irwin commenced negotiations with T J Richards with the hope of amalgamating South Australia's two biggest body builders. Richards had approached Holden with the proposal for a takeover, but the deal fell through. The need for larger production facilities saw the purchase of land adjacent to the King William Street plant on the corner of Halifax and Symonds Place. As body production increased the works manager, W A Holden, Edward's younger brother, was dispatched to America to investigate improved production methods.

By mid-1922 plans were in place to duplicate the four-storey plant alongside the existing King William Street plant, so the former F T Hack/Holden & Frost building at number 400 was demolished. A £10,000 bank loan secured the finance. At this time the major bottleneck was the wood mill. Holden took a lease in Gilbert Street, relocating the railway carriage production to that site. This permitted the wood mill to expand, lifting production yet again. The magic 150 bodies per week was reached and HMBB were Australia's largest body producer with over 25% of the local production.

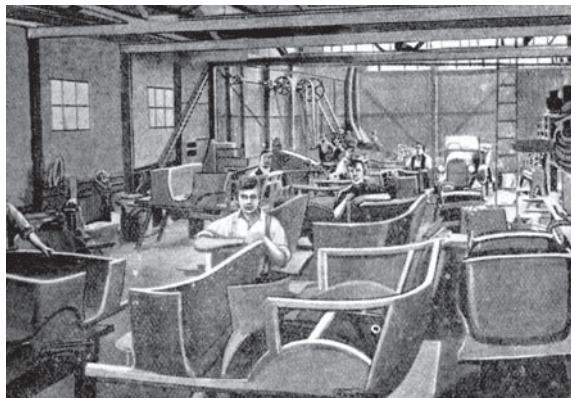
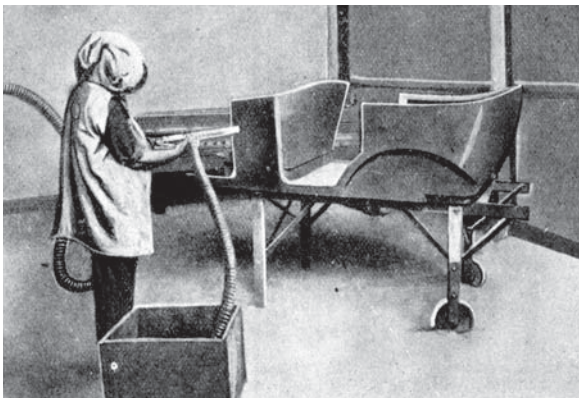


Fig. 6.12

Holden Motor Body Builders 400 King William street works, the former F T Hack building 1918. On the left sand blasting the body prior to painting and right the main assembly space.

The Australian Motorist

The decision to purchase land at Woodville led Holden closer to General Motors, but it could have easily been Ford they made an agreement with. Both companies had representatives in Australia in 1923 looking at the Australian market. Ford Canada dispatched Hubert French and Mel Brookes to survey the Ford distribution and agent network, and Edward Riley arrived to formally sign an agreement with Holden for GM total Australian body production. This agreement would also provide a transfer of design and manufacturing technology, in both written and physical form. The new factory also moved Holden towards a true production line, the King William Street plant was spread over four floors and production appeared to follow no set pattern. From 1923 a flow of GM engineering and manufacturing personnel began to arrive at HMBB.³⁶

F T Hack & Company

The firm F T Hack & Co was managed by Frederick Theodore Hack, son of Albert Hack. Albert and close friend, Thomas Pengilly, had joined forces in 1904 at 50-52 Flinders Street, Adelaide to build buggies and sulkyes. By 1906 the firm had established a motor body building department and were producing the English/French Roi de Belges style body, said to be the first body of its type in Australia. The firm also reported that they were expanding their motor body building with the purchase of new machinery.³⁷

In June 1908 Hack Snr passed away and his share in the business was taken by his son, Frederick. In May the following year, Pengilly retired, aged 69. The partnership was dissolved and Hack took over the debts and assets.³⁸ The new firm, F T Hack Limited prospered and in 1913 Hack headed overseas to Europe and America as an honorary commissioner for the South Australian government to determine trends and construction methods, his trip being sponsored by the South Australian Government.³⁹ On his return new machinery was ordered and by January 1914 new premises at 400 King William Street had been erected. (Fig. 6.13) At this time the firm employed 35 staff and were producing made to order bodies in five weeks.⁴⁰ The firm is known to have produced bodies for Minerva chassis in this period.⁴¹ (Fig. 6.14) It would appear that WW1 had an impact on Hack's staff, reducing the firm's capacity, Hack also left the firm, moving to Sydney and leaving his wife in control.

F T Hack did produce a few bodies for the South Australia Metropolitan Fire Service, delivering the first 12 after November 1916. The contract was let by Eyes & Crowle who ordered engines, transmissions, chassis, differentials and other mechanical components from Malicet & Blin of Paris. F T Hack then assembled the fire engines using local wheels, axles, springs and a fully equipped fire tender body. (Fig. 6.15)

Following the sale of the Adelaide business to Holden for £9,000 in 1917 it may have been expected that Hack would spend some time in the new Holden & Frost enterprise; however, he remained in Sydney where he set up a small shop in Missenden Road, opposite St John's College.⁴² His name was not on the business, instead a Joseph Neal Grace held the title of the Missenden Road Body Works.⁴³ Grace was not a body builder, he and his brother Albert had started a drapery business in 1883 and by 1920 were incorporated as Grace Bros Ltd.⁴⁴

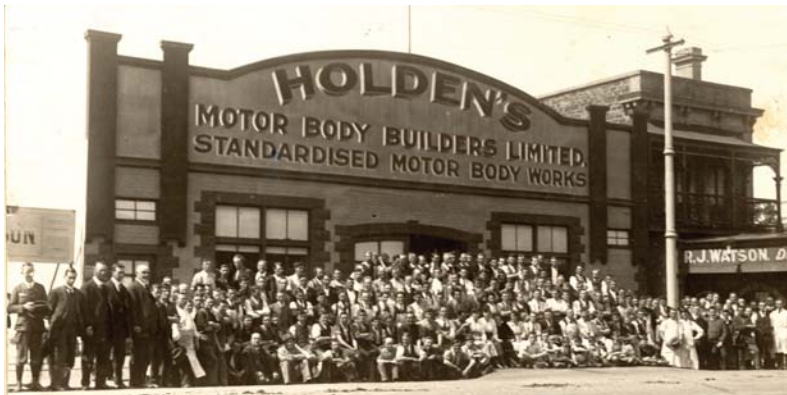


Fig. 6.13
Former F T Hack & Co bodyworks at 400 King William street purchased by H J Holden in 1917. Image taken 1919.

Holden



Fig. 6.14
1917 Hack bodied Minerva chassis.

W Sides

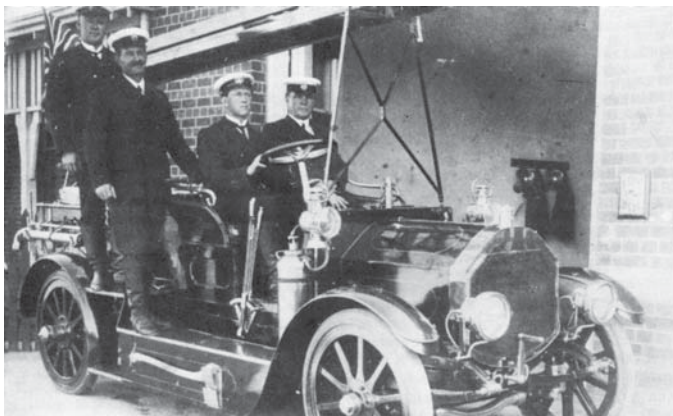


Fig. 6.15
The first of 12 M.A.B.(Malicet and Blin) chassis with F T Hack bodies and fire equipment produced in the Hack works between 1916 and 1917.

SA Metropolitan Fire Service

It is unknown how Grace and Hack came to unite but I surmise that Grace, who lived around the corner, met Hack when seeking delivery vans for his growing business. Hack was likely to have been under a legal restraint not to commercially produce bodies following the sale of his business. In early 1920 this obstacle was cleared and the firm Missenden Road Motor Body Works Ltd was registered with a capital of £11,000. Directors were Joseph Grace, his wife Sarah, his brother Albert, Grace Bros Secretary Harold Cush and Hack.⁴⁵

The firm initially advertised as an upholsterer and by 1924 as selling and installing California tops for touring cars and buses. They were the first to produce a California top bus in Australia and bus production became the major part of their business.⁴⁶ In 1925 they took a contract with Dalgety and Co Ltd to produce 32 passenger buses on White truck chassis. (Fig. 6.16) In 1924 Hack imported from America a Duco plant to take advantage of the new medium of spray painting, announcing in 1928 that: “Handwork was incompatible with modern ideas” and “Mr Hack’s huge Duco establishment in the Parramatta Road, Leichhardt is the outward and visible sign of his opinions”.⁴⁷

From 1926 the business was trading under the name Missenden Coachwork and provided sketches to *Motor Life* of high class motor bodies. One, on a Morris Cowley chassis was described as: “a smart four-passenger sports car”, only it had two doors, one on the left side for the driver and front seat passenger and one on the right side at the rear. The body was built using aluminium but featured red or blue painted top panel, fenders and valances. (Fig. 6.17) Nothing further is known of the company until it was put into receivership in August 1933.⁴⁸

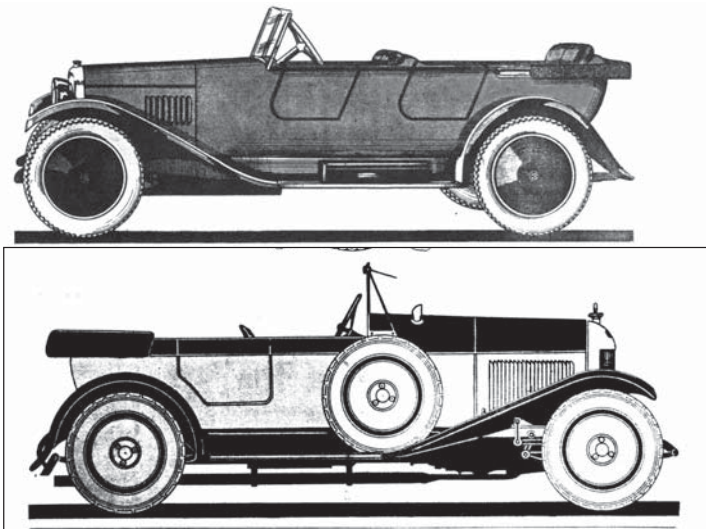


Fig. 6.17 Drawings of Fred Hack’s Missenden Coachwork sporting bodies for touring cars. **Motor Life February 1926**



Fig. 6.16 Advertisement for California tops by Fred Hack’s body building firm, Missenden road Motor Body Works Ltd. **Motor Life**

General Motor's entry into Australia

GM were far better organised in Australia than Ford. The GM Export Company had established an office in Sydney from February 1912 with E S Pendleton in charge and he was given the task of assigning GM agencies, the first being to H C Richards for the 1913 Oakland Model 42.⁴⁹ The Export Company also established a Melbourne office and continued to process orders from agents and distributors, as they were responsible for the dealer network, taking chassis orders and handling warranty claims. Until 1923 the Export Company had no interest in Australian body building. By 1922 HMBB had the majority of body orders for Chevrolet, Buick and Oakland; this meant the company was producing a sizable portion of its production for GM chassis. By June 1922 this was of interest to GM who charged the newly appointed head of the Export Company, James D Mooney, with ensuring Chevrolet sales would overtake the Ford T in markets outside America.⁵⁰

Mooney promptly organised a survey mission that included Australia, where the task was to examine ways in which unit cost could be reduced on export packs and determine if their own body building operations should be established. Under the leadership of Edward C Riley, the London office manager, the GM personnel visited the Holden operation and came away highly impressed. On learning of Holden's intention to build a new plant at Woodville, the Export Company made an offer of a contract for all GM's Australian sourced car bodies, provided Holden gave them exclusive use of the new plant. The Holden board agreed in December 1923 and effectively gained access to GM design and manufacturing expertise with the expectation they would conform to their build standards.⁵¹ In 1923 Holden's biggest press was a 25-ton Ferracute that J R Holden described as hopelessly inadequate.⁵² A Melbourne company, Hydro Press, advertised press capacity using a patented rubber bag and female die method but it was unsuited to high capacity production runs.⁵³ Holden became involved with the company (H J Holden was a director) but found the process was too slow and did not provide sufficient draw for their needs.⁵⁴ (Fig. 6.18)

Melbourne Motor Body Company (MMBC) claimed to have installed Australia's first large panel press, a 350-ton Hamilton, in the late 1920s, even though Holden Motor Body Builders had a locally made 300-ton press in 1924. The MMBC's first press was likely similar to the Hydro-Press.⁵⁵ Holden was pressured into a larger panel press by General Motors following the GM agreement that the Australian GM bodies would look like the American ones.⁵⁶

Mooney said at the time: “Australian body builders make good bodies and put good stuff into them, and when better Australian bodies are made Holden will build them”.⁵⁷

In 1924 Holden approached GM for help to purchase a large panel press quickly and Ronald Evans, an experienced planning and mass production expert, was dispatched from the USA. On arrival at Holden in late 1924 Evans realised that the procurement of a press from overseas would take 12 months so he set about to have one built in South Australia. He chose Forward Downs & Co, mining equipment manufacturers, to build the 300-ton press. The job was completed in three months by Norm Pointer, a young engineer and Geoff Roper, a draftsman, who both would later join Holden, Pointer rising to become GM-H’s Chief Engineer.⁵⁸ (Fig. 6.19)

Evans returned to the US to become later the Vice President of the GM Engine Divisions in 1936.⁵⁹ Forward Downs produced three similar presses for Holden over the next 12 months. The introduction of large panel presses dramatically reduced the cost of bodies. In 1918 the average cost for a standard tourer body was £50-55, but by 1925 it was just £5.⁶⁰ A further two presses were obtained from Toledo (400-ton) in 1928, then two (500-ton) from Vickers Ruwolt in Victoria by 1935. (Fig. 6.20)

Evans was not the first US expert to arrive at Holden. In January 1924 Harry Miner, Charlie Hartmann and Thomas Hawkes arrived. Hawkes, a wood mill superintendent at GM Canada Oshawa, arrived with his wife and son. Hawkes, although 60, he had agreed to stay in Australia as the GM representative at the plant, advising on the best manufacturing techniques. He brought with him a 1924 Chevrolet body, disassembled, so that the Holden body builders could see how the GM plants produced bodies.⁶¹



Fig. 6.18
Hydro press advertisement from 1921.
The Coach & Motor Body Builder

Hawkes was aged 15 and the son of an English carpenter, when he immigrated with his family to Oshawa in 1864, where he found work as a wagon maker. By 1901 Hawkes was working for McLaughlin Carriage Works as a wood worker and ten years later was a foreman.⁶² McLaughlin was purchased by Fisher Body and so became part of the GM empire. Harry Miner was touted as a Fisher Body trim expert, although Holden discovered his talents lay only in hood manufacture while Hartmann was an assembly mechanic who was later described as not having much impact.⁶³ One GM employee to make an impact was John Pawloski, who arrived at the end of 1924. He was a die tooling specialist and later became the Woodville tool room supervisor. In 1925 Beau Foss arrived to supervise the introduction of Nitro Cellulose (Duco) paint.⁶⁴

Concurrent with the agreement with the GM Export Company was the introduction of a formal body drafting area in the Holden King William Street plant. Up until 1923 Holden had produced their sample bodies by utilising the skills of their best body builder who would make a body using a chalk drawing.⁶⁵ The first draftsman to be hired was Herbert Wylie, a former Duncan & Fraser coachbuilder, who learned his layout drafting skills with Ford in America.

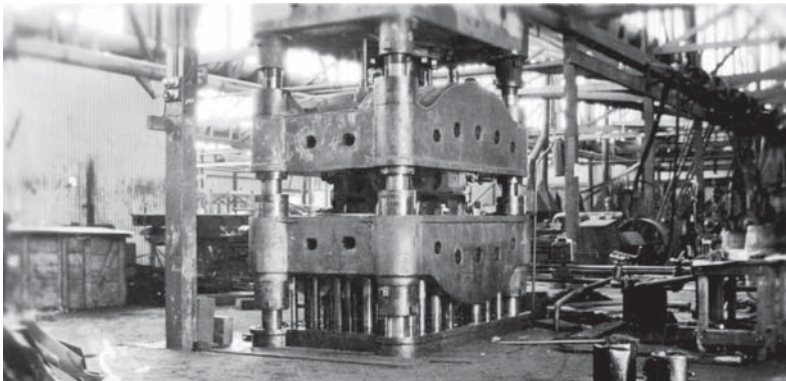


Fig. 6.19
300-ton press built by Forward
Downs in 1924.
HMBB - Woodville



1928 Toledo press
1935 Vickers Ruwolt presses
1924 Forward Downs presses

Fig. 6.20
Woodville press line c1935, three
Forward Downs 300-ton presses in
foreground and two large 500-ton
Vickers Ruwolt presses (installed in
1935) on left hand side and on the
right a large 400-ton Toledo press
installed in 1928. The Forward Downs
presses were still operational in the
1950s, but not at Holden.

Holden Collection SA Mortlock Library

Wylie went to Canada following the death of his wife in 1919 and worked on the assembly line in the Canadian Fisher Body plant. He had attempted to gain entrance to America but was refused in the first instance and so took private drafting lessons eventually gaining a position in the Fisher drawing office. From here he moved to Ford where he became a first-class body draftsman. On returning to Australia in late 1921 Wylie joined Holden and also began tutoring his 14-year-old son, Thomas Wylie, who would join his father and Charles Phillips to form the Holden Woodville drawing office in 1924.⁶⁶ (Fig. 6.21) The young Wylie recalls hanging hessian walls to divide the drawing area from the King William Street tool room, annoying his father, the chief draftsman, who perhaps thought his son was exceeding his authority by acting without approval.⁶⁷ The King William Street drawing office was formalised in its own building around 1925. A photograph taken in this period shows Wylie senior with draftsmen, Phillips and Thomas Wylie, plus trainees, Valentine Stacey, Hartley Chaplin and Roy Rainsford.⁶⁸ (Fig. 6.22) With such expertise in his office H J Holden could defend his company's workmanship:

It has been reported that Australian workmanship is being seriously challenged. This is not in regard to our own



Fig. 6.21
HMBB King street Drafting office c 1926. Charlie Phillips at front, Bert Wylie standing on left.
Holden - HMBB

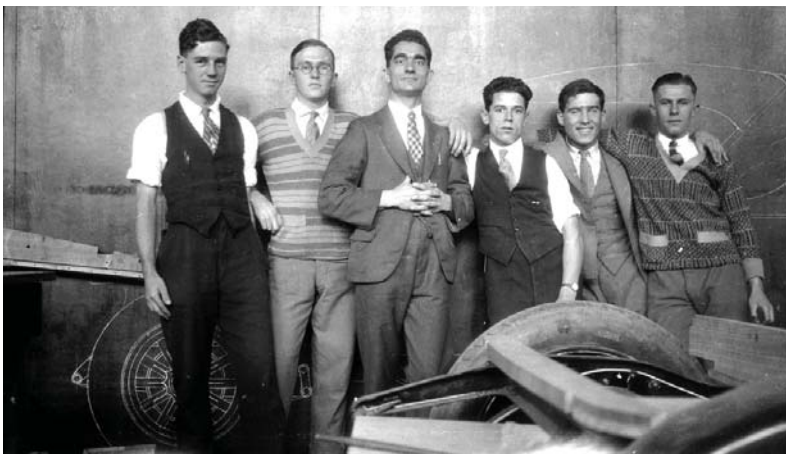


Fig. 6.22
Holden Motor Body Builder's first design team. (Left to Right) Charles Phillips (draftsman), Val Stacey (trainee), Herbert Wylie (Chief draftsman), Hartley Chaplin (trainee), Tom Wylie (trainee) and Roy Rainsford (draftsman). Photo taken in King William street drawing office c1926.
Holden - HMBB Mortlock Image BRG/1/3/114

organisation. It has also been said that imported bodies are showing distinctie [sic] lines. This situation has been met by dispatch to us from America in advance drawings, blue prints, and photographs of innovations and improvements. These have been introduced, and we are still introducing them. On the other hand some traders ask for more distinctive Australian body. In this case our draftsmen prepare and submit styles of bodies, which when accepted become standardised for that particular body for Australia.⁶⁹

The establishment of layout drafting saw the introduction of full-size drawings that showed a side view, half a plan view and half a front and rear view. The drawings, initially on paper, were first gridded with lines forming 10-inch squares numbered from 0 and a body layout would include sections and major mechanical parts such as the steering column and wheel and door hardware location. The layout drawings had no dimensions other than 10-inch grid lines; a further complication was that side, plan and end views were all drawn over the top of each other.⁷⁰ Without proper training and a high degree of skill, an automobile layout drawing just looked like a jumble of converging lines. The draftsmen employed, particularly at Holden, to provide layout drawings became Australia's first automotive engineering designers. As the local South Australian educational institutions lacked courses in this specific field, training was conducted in-house.⁷¹

In early 1924 Holden produced their first closed body on an Essex 6 chassis under the direction of Wylie, one of 24 ordered by the Essex agent.⁷² (Fig. 6.23) Edward Holden had recognised that closed bodies were becoming more prevalent and urged his father to promote them, H J (Holden) replied: "You're wasting your time the closed car will never catch on in Australia. We enjoy too much fresh air and sunshine".⁷³ Closed body construction commenced in earnest in June 1925 with a further order for 25 Essex sedans and Holden expected production of closed cars would reach 2,000 per annum by 1926.⁷⁴ (Fig. 6.24)

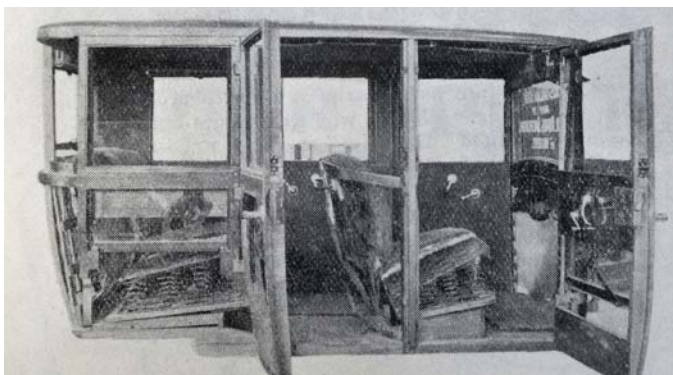


Fig. 6.23
Chevrolet Sedan body prepared for a motor show c1926 illustrating design and construction methods.
Holden - HMBB



Fig. 6.24
1924 Essex chassis with HMBB's first sedan body. Somewhat dated in style with upright coach pillars.
Holden - HMBB

T J Richards

Australia's second standardised body builder was also South Australian but unlike Holden had its origins in the coach and carriage industry. T J Richards & Sons Ltd was started by Tobias Richards, the son of English emigrant, John Richards, who arrived in the Colony of South Australia in 1848. Tobias was born north of Adelaide in Montacute and following his marriage to Matilda Freeman was making cordial in Gawler. By the early 1880s he had established a blacksmith shop making coach and buggy hardware in Unley and later moved to Mitcham and established T J Richards & Company, wheelwright & coach builder. At the time Richards coined the name King of the Road for his prize-winning Sulkys.⁷⁵

In 1903 Tobias took his sons, Henry a painter, Claude a blacksmith and William, a trimmer, into the business. A fourth son, Herbert, initially worked with his father but was told to look elsewhere. He took an agency for James Alston's windmills and then set up his own company, H C Richards Ltd selling farm implements and machinery.⁷⁶

In 1912 T J Richards began to produce motor bodies in Hindmarsh Square Adelaide and Tobias decided to retire. H C Richards joined the board as Chairman. C A Richards took a majority shareholding and became the Managing Director. On 17 May 1915 H E Richards was killed in a motorcycle accident leaving his two brothers to run the company. By this time, they were producing large numbers of army horse drawn vehicles and army motor bodies for the war effort.⁷⁷

Following the embargo of 1917, the company's motor business outgrew the existing workshop, requiring the purchase of 14 acres of land in Bay Road, Keswick where a modern factory was erected. At this time horse drawn vehicle production ceased and individual motor body orders were no longer taken. By 1922 production had reached 115 bodies per week and 200 employees were engaged in production of Richard's King of the Road motor bodies for Hupmobile, Durant, Rover, Standard, Austin, Overland, FIAT and Maxwell.⁷⁸ (Fig. 6.25)

At the works indicates timber frames were constructed from seasoned oak and the company imported hood material and small hardware items from the UK and USA. The plant was powered by a steam engine and boiler running drills and hammers. The first panel press arrived in 1924 but there was no assembly line until 1926. The company, T J Richards & Sons Ltd was registered in October 1924, turning a profit of £24,340 in the first year. Richards established assembling works in Melbourne (Wearne and Sons), Sydney, Brisbane and Perth to place completed bodies on chassis.⁷⁹ In 1922 the firm took an order for Dodge motor bodies, which eventually led to more Dodge and Chrysler company work and a close association with the local Dodge/Plymouth/Chrysler distributor.⁸⁰ Up to 1925 all Chrysler car chassis



Fig. 6.25
Two views of the T J Richards assembly operation c1922.
There was no assembly line and little effort to develop a flow of work in the body building section.
SA Library neg B28400/4 & /12

imports arrived with American bodies but in October 1925 Richards took a Chrysler body order.⁸¹ In 1930 it was announced all Dodge cars under construction by T J Richards would have the same design as adopted by the Dodge Co of America, involving a die tooling cost of £7,000 per body type. In announcing the new contract, the Chrysler Company said 90% of their business in Australia was being done at Richards.⁸²

The move by Chrysler, through their Australian distribution arm, ensured they had continuity of supply and that the T J Richards product looked like the American offering. Chrysler sent advanced drawings and technical data to Richards to ensure this occurred. Chrysler would in the future also provide detailed information on producing all-steel bodies. The entry of the three large American auto producers, one directly and two through Australian companies, ensured both continuity and common design. More importantly for the Americans, it guaranteed they held the biggest market share, principally at the expense of the British manufacturers. During the period from 1923 to 1928 imports of American designed chassis rose from 79% to 85%. (see table 6.1)

Chrysler

As Walter Chrysler did not form his corporation until 1924, Chrysler dealings in Australia were handled by individual state distributors. In 1928 the Chrysler Export Corporation was formed with H B Phipps appointed the Australian manager.⁸³ Phipps was replaced with William Ferguson in 1931 and he established the Chrysler Dodge Distributors (Aust) Ltd in 1935, taking the position of managing director.⁸⁴ This firm controlled all Chrysler product ordering and marketing in Australia and also took a controlling interest in T J Richards and Sons. Shareholding was jointly held by the former 18 Chrysler, Dodge, DeSoto and Plymouth state distributors. Then, in the end, Chrysler took total control of the Australian operations on 1 June 1951.⁸⁵

Other large body builders

The distribution of other European and American makes in Australia was similar to Chryslers network. In addition to the two large standardised body builders were two medium producers that directly supplied their own motor sales companies, Melbourne Motor Body Builders part of the Tarrant organisation, and Duncan & Fraser in Adelaide. Both these companies expanded their body factories to meet the increased sales, both were mainly

supplying Ford bodies, yet it appears little co-operation in design existed. Alongside the large and medium standardised body builders were the smaller firms, Martin & King and Jas or James Flood that evolved from the coach building era. They became successful in producing high class bodies to order and in due course became significant producers. Other firms included: Smith & Waddington, Propert and Steenbhom in Sydney; Hope in Brisbane; Dan White, Damyon Brothers, Waring in Melbourne; and Vout, Chisholm & Sons in Hobart.

Martin & King, a partnership between coach smith, Alan Martin and coach body builder, Joseph King, were slow to take on motor body building despite producing the body for Herbert Thomson's horseless carriage of 1896. Martin left after about 12 months, but the firm's name remained and in 1916 King's eldest, Thomas King, took an active interest in the business, enrolling in a four-year apprenticeship with schooling at the Working Men's College in both body building and panel beating. King senior was not keen on the motor car but with an avid son now in training, produced a steel bodied Ford in 1916. Following King junior's apprenticeship, motor body production increased and in 1923 the young King became a partner with his father. Recognising the motor cars' potential, Thomas King convinced his brother, William King, to study engineering at the University of Melbourne. He graduated in 1925 with an Electrical Degree and in 1927 added a mechanical engineering degree.⁸⁶

By 1925 the firm had gained a reputation for high class motor bodies producing work for the agents of Ansaldo, Aurea, Bayliss-Thomas, D.F.P., Hillman, Rolls Royce, Wolseley and Delage. Four large bus bodies were also produced for the Victorian Railways for use on the Mt Buffalo Chalet route. The company was able to draft scale drawings (blueprints drawn at 3/4 inch to 1 foot) and sketches of motor bodies for customers. (Fig. 6.26)

James Flood founded his specialist body building company in 1907 at a former West Melbourne brewery works located at 33 Stanley Street. Flood, advertising it as: "The only motor body builders in Victoria with 10 years' experience".⁸⁷ Flood, who grew up in Essex, England, trained at a Clapton Brougham factory and immigrated to Western Australia in search of gold in 1904. Realising his fortune lay with his trade he came to Melbourne taking on work with Tarrant motors where, in 1907, he produced Australian's first closed car body on a De Dion-Bouton chassis. Flood then worked briefly for the Kellow-Falkiner organisation before establishing his own firm in 1907.⁸⁸

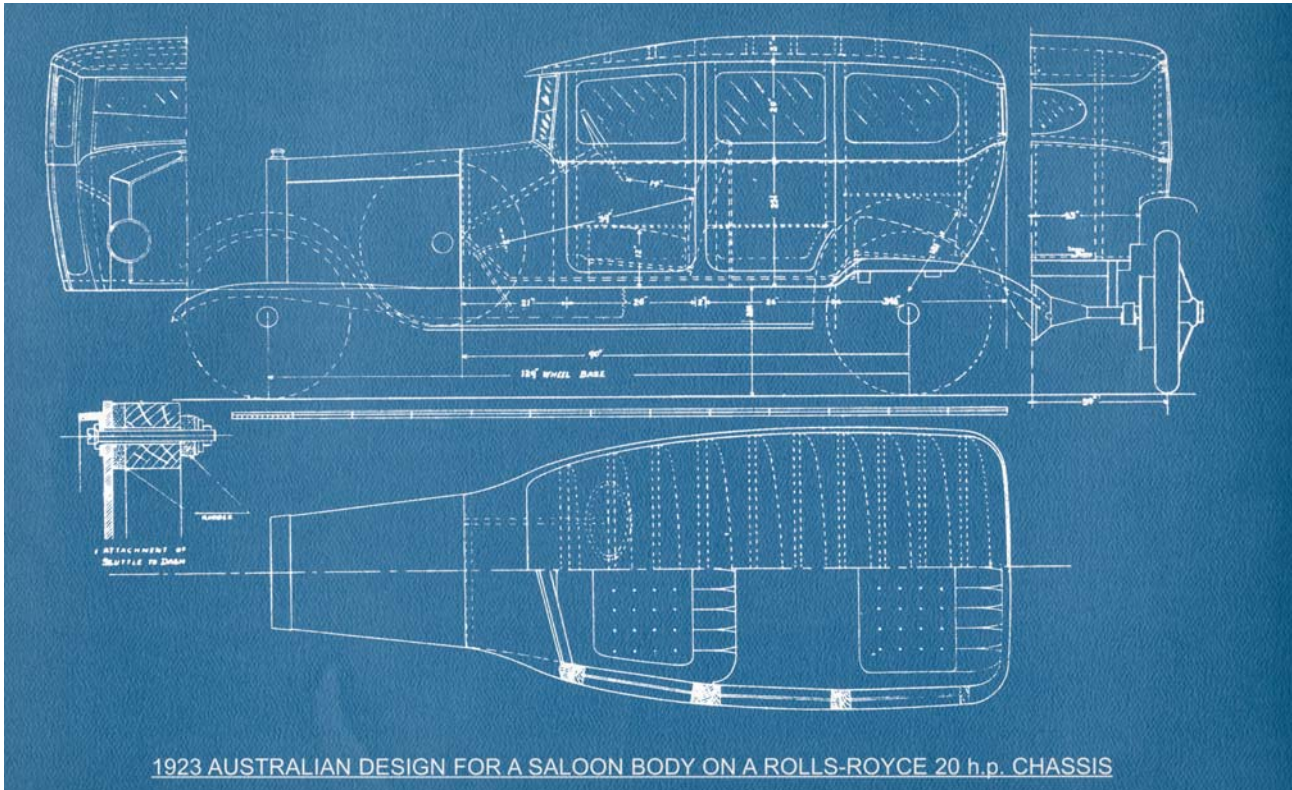


Fig. 6.26
 Rolls Royce 1923 body drawing by Martin & King on a $\frac{3}{4}$ inch to 1 foot scale.
 Rolls Royce Club of Australia Archive

The business prospered and by 1910 was located near 15 City Road, South Melbourne and a year later in St Kilda Road opposite the Shrine of Remembrance, producing high class bodies for Rolls-Royce, Delage, Hispano-Suiza, Bugatti, Mercedes, OM, Minerva, Stutz and Itala, for which he later held the Victorian agency from 1919 to 1925.

Flood also produced bodies to order including one-offs in any size. (Figs. 6.27 & 6.28) In 1915 the business was destroyed by fire but quickly recovered only to again be damaged when an adjoining business burnt down in 1920. Flood adopted mass production techniques and recognised the move to all-steel bodies, adjusting his designs to take advantage of the changes in production methods during the 1930s. Design work was overseen by William Pretty, an engineer who had been employed in 1914, trimmer Fred Presswell who commenced in 1912 and foreman Bert Brown who started in 1919. Following James Flood's death in 1955 his son, also James, took control of the business.⁸⁹

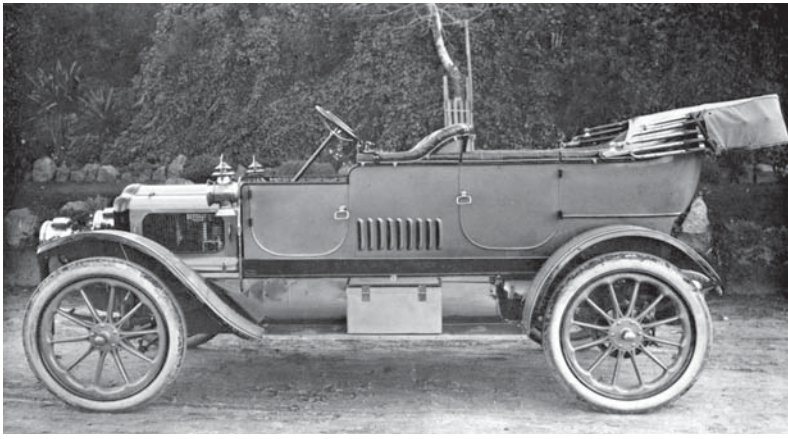


Fig. 6.27
Flood body on a Stanley Steamer.
**The James Flood Book of Early
Motoring - Book 1**

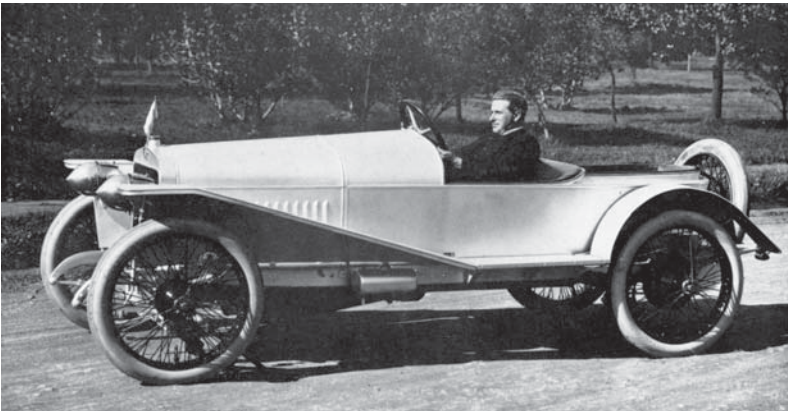


Fig. 6.28
Flood body Hispano-Suiza chassis -
J W Flood driving.
**The James Flood Book of Early
Motoring - Book 1**

Ford: the first phase to 1922

In New South Wales the distributor, Davies & Fehon purchased their Ford bodies from Steenbhom Ltd after 1912. The Davies brothers also controlled the Brisbane distribution of Fords. Initially, Davies & Fehon purchased their bodies from several small builders, then Lewis Davies realised he needed a standard unit and thus purchased a controlling interest (51%) in Steenbhom Ltd. In 1918 Steenbhom Ltd built a new plant in Alexander, Sydney and by the end of the year were employing 250 workers producing 75 bodies per week.⁹⁰

Steenbhom Coachbuilders were established in 1885 by Abraham Steenbhom the son of a Polish immigrant Aaron Steenbhom. In 1909 younger brother, Jacob Steenbhom joined and the company at Palmer Street, Sydney trading as Steenbhom Ltd. Jacob then briefly ran his own coach and motor works in Campsie and served in the naval militia. In 1916 he returned to Steenbhom Ltd, now fully engaged in motor body building. The Ford bodies built in this era did not display modern lines, their torpedo body retained a distinct lift at the rear seat, heavy side mouldings and a flat dashboard to suit the T Ford dash panel. Compared to the body produced for Tarrant by the Melbourne Motor Body Works the design was indeed out-dated. (Figs. 6.29 & 6.30)

By 1920 four Steenbhom brothers were part of the business, Abraham heading the firm, Menasseh a trimmer, David an accountant and Jacob the body builder. Jacob Steenbhom became involved with Sydney's Technical Colleges, serving on the Motor Body Building Advisory Committee and various selection committees for trade teachers and exam questions. He was also instrumental in establishing training and a motor body building class for returned servicemen at both the converted Darlinghurst goal in 1922 and at the East Sydney Technical School.⁹¹

The Brisbane agency, Queensland Motors established a crude body factory that according to Ford Canadian representative Hubert French, made no attempt at continuous production. French counted 16 different models all being built in the one place with a resulting confusion and lack of economy. French was also stunned to learn that a customer could order a wider, longer or higher body.⁹²

Robert Nettlefold in Hobart and Duncan & Fraser in Adelaide continued to produce their own versions of the T Ford body. Generally Ford bodies of the period quickly gained a reputation of being shoddy. Nettlefold was an exception and after Ford US shipped T Ford chassis in Completely Knocked Down (CKD) form, overall Ford quality improved, however a 1920 motor show report revealed Ford: "were attractive but the fit of the panels and upholstery left a lot to be desired".⁹³ (Figs. 6.31 & 6.32)



Fig. 6.29
1913 Ford T deluxe body built by Melbourne Motor Body Works for Tarrant.

History of Ford in Australia



Fig. 6.30
1914 Davies & Fehon advertisement depicting a Steenbhom Torpedo body.

P Kable

In Melbourne the process for putting a T Ford together in the early 1920s was as follows:

Auto Car Industries landed T Ford CKD packs and moved them to their Sturt Street South Melbourne plant for assembly. Standard touring and all roadster bodies were built at Melbourne Motor Body Works in Russell Street and delivered to Tarrant's Lonsdale Street works for final assembly.⁹⁴

Deluxe bodies came from the Holden works in Adelaide and were fitted to the Ford chassis in Holden's South Melbourne plant. Tarrant thought their assembly operations were as: "advanced as anywhere else in the world". French, however, described the assembly as a disgrace to our Ford organisation: "The plant does not boast a single mechanical device for the efficient handling of materials and as far as I could see confusion reigned supreme".⁹⁵

French was also dismayed at the variety of T Ford bodies being produced across Australia, in addition to the major distributors small body shops were acquiring chassis and producing their own design. (Fig. 6.26)

In South Australia the Ford distributor, Duncan & Fraser, was a company that dated back to 1865 and a partnership between Scotsmen, Robert Duncan, coach builder and Robert Fraser, coach painter. The firm grew and by 1876 were producing railway carriages and assembling American made tram cars. In 1884, 16 acres of land were purchased at Kilkenny (Woodville) adjacent to the Port of Adelaide and a large factory erected.⁹⁶

In 1900 Adelaide motor agent, Vivian Lewis, had Duncan & Fraser build a motor body and from that point James Duncan saw the motor cars' potential. In addition to producing motor bodies and carriages the company took an agency for the Oldsmobile in 1903 and employed a young salesman, Albert Cheney and an office boy Fred Mann. Both would leave their mark on the Australian Motor Industry.⁹⁷

In 1908 James senior died leaving the business to his four sons, James, Robert, Archie and Richard; however, Fraser senior's share had passed to James Duncan. By 1909 Duncan & Fraser were selling Argyll, Standard, Singer, Chalmers, BSA and the new Ford T model. (Fig. 6.33) The growth of the Ford sales led the firm to form Duncan Motors Ltd just to handle them. Duncan & Fraser continued to sell other makes and build all their body requirements. When the embargo arrived, a new plant was built at Mile End

and later the Kilkenny factory was sold off to Holden. Duncan & Fraser were progressive in their body design, with the youngest Duncan, Richard, taking control of this aspect of the work. The firm employed Herbert Wylie, later Holden's chief draftsman/designer, in 1919 as a body builder and in 1924 took on apprentice draftsman Lewis Bandt, who later moved to Ford Australia in 1929 when they set up in Geelong.⁹⁸ As Duncan & Fraser were producing a standardised body, Duncan turned to T J Richards to produce a stylish sporting roadster in 1917. When Ford established their own manufacturing plant, Duncan & Co and the other distributors lost the Ford body business. Happily, Duncan & Co were contracted to supply Ford T bodies until the Ford Geelong plant came on line. The last of the 500 Ford T bodies produced in the Duncan & Co plant ran in April 1926.⁹⁹

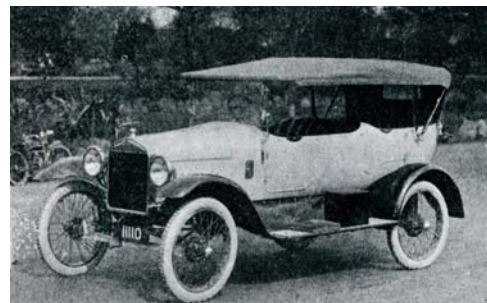
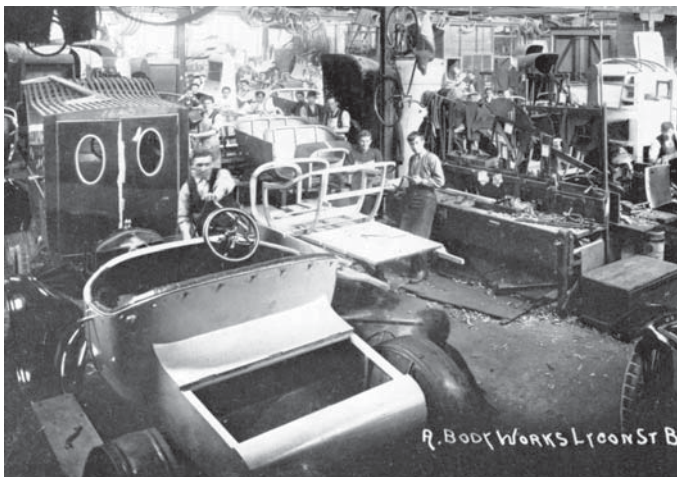


Fig. 6.31
Above. 1917 Ford T Touring body built for Tarrant by Melbourne Motor Body Works. **Ford (Aust)**
Left. Melbourne Body Works c1920.
RACV Archive

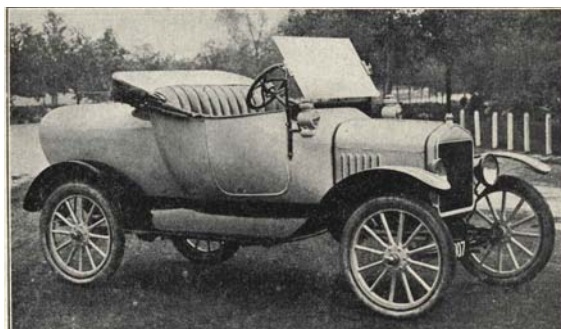


Fig. 6.32
A major problem for Ford America was the diversity of body design. The 1917 Ford Roadster built by Waring Bros. is a good example of how Australian body builders modernised the dated T Ford with progressive styling.
The Coach & Motor Builder Oct 1917, 146

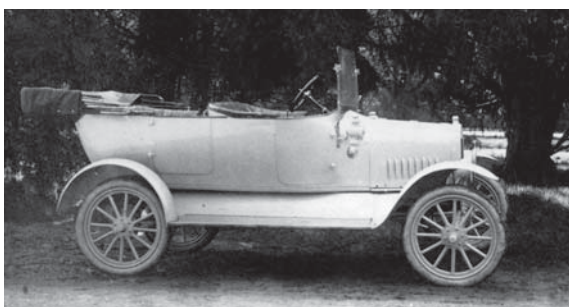
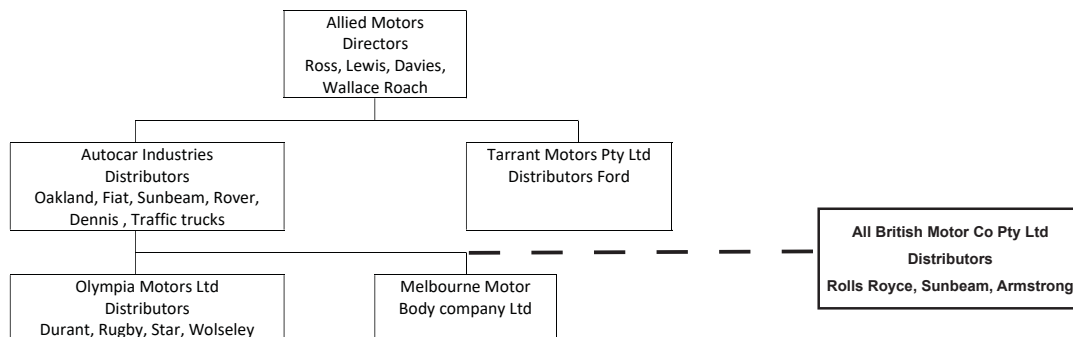


Fig. 6.33
1917 Ford T Touring body built by Duncan & Frazer.
P Kable

Ford's new plant also had an impact on Melbourne Motor Body Company (MMBC). From about 1916 all Tarrant's standard Ford T bodies were built by this related firm. (see Fig. 6.34 for Tarrant company structure))By the early 1920s the Melbourne Motor Body works were producing an up-to-date style. Still, when Ford Australia was established in 1925 and the Ford body business was lost, the firm had to rely on other makes sold through the organisation under the Autocars Ltd control. Tarrant picked up Oakland cars and then Pontiac, but both these GM vehicles had bodies sourced at Holden. Evidence of MMBC bodies being fitted to Oakland chassis can be found in surviving cars suggesting Tarrant found a way around GM's agreement.

The largest selling car in Australia after 1912 was the Model T Ford, originally selling at £195 with sales effectively controlled by Arthur and Lewis Davies in Sydney. Their firm, Davies & Fehon, acquired the Australian Ford distribution rights in 1906, surrendering South Australia to Duncan & Fraser in 1910, Victoria to Tarrant in 1909 and Nettlefold in Tasmania in 1910/1911.¹⁰⁰

A subsidiary of Davies & Fehon, Queensland Motors, was established in Brisbane in 1909.¹⁰¹ From August 1917 Ford shipments were partially knocked down to conserve freight space forcing the distributors to establish assembly plants. Duncan and Fraser, for example, assembled six Fords per day by February 1918, the packs arriving from Canada in sets of 12 boxes with 382 separate parts for each car.¹⁰²



Ref. Hubert French memo to Ford Canada 14 December 1923, Ford Australia archives.

Fig. 6.34
Structure of Tarrant's after 1920.

Ford Australia: The French Report

By 1922 Ford Canada became concerned that the Australian sales per population were lagging and despatched Hubert French and Mel Brooks to Australia to survey the distribution of their product. A series of letters from French and Brooks have become known as the *French Report* and document the assembly, sales, service and distribution of Model T Ford cars and trucks in 1923.¹⁰³

French said of Duncan's South Australian assembly methods: "While their assembly appears to be somewhat cumbersome, it nevertheless is better by far than the assemblers in any of the other states".¹⁰⁴ French's view of the Queensland operation was completely different:

Queensland motors make no attempt towards continuous production and any standard model. I counted 16 different types of bodies being manufactured on one floor with all the resultant confusion and lack of economy that comes with it.¹⁰⁵

Following the embargo an attempt was made by Ford Canada to standardise the Australian Ford model T body. Mr Lawrence arrived from Canada in 1919 to oversee the establishment of a Body Building Committee with the goal of producing a one-design body across the distributors. This effort failed, and each Ford distributor continued to build their own design.¹⁰⁶

French and Brooks were dismayed at what they found, the Davies Brothers largely controlling the distribution through directorships and having been severely bitten holding large stocks of Fords in a 1916 sales slump, they refused to order more than a minimum of cars.¹⁰⁷ French approached Holden in early 1924 to determine if they could produce Ford's total Australian body production but he was too late, a deal had been signed with GM. French then recommended that Ford establish their own body and assembly plant in Australia, which in turn led Wallace Campbell of Ford Canada to write to Edsel Ford on 24 September 1924 urging the establishment of an Australian manufacturing operation.¹⁰⁸

Ford Australia was established on 1 January 1925 with a US\$3 million credit and French as Managing Director.¹⁰⁹ The first car came off the temporary Geelong assembly line, run in a former Dalgety wool store, on 1 July 1925.¹¹⁰ (Fig. 6.31) Ford had no real need for local designers as they were producing the American designed model. A contingent of Canadian Ford personnel arrived in October 1924, among them, C C (Slim) Westman, who would direct the manufacturing and engineering.¹¹¹ Just one designer, a draftsman,

Lewis Bandt was employed in 1929. P W Grandjean, Ford Canada Treasurer, indicated the new plant would follow the latest processes that were in vogue in the Canadian plant: “Conforming with our general policy, only high class materials will be used, preference wherever possible, being given to Australian made products”.¹¹²

The new Geelong assembly plant design was copied from Ford’s Toronto plant and work commenced in May 1925. The body design selected by Ford was more modern than the American design with the cowl top lowered to provide straight through appearance, the cowl was also made in three parts and featured a join line on each side. (Fig. 6.35) Other changes were made to provide improved assembly; spot welded tabs were used to provide quick fixing over the frame and a swage on panel edges provide a neat join without the need for expensive tooling jigs. These have become known as the Dalgety Fords as they were assembled in a former Dalgety wool store. (Fig. 6.36) Ford Australia produced both tourers and roadsters at the outset in the temporary facilities as it took three years before the body plant came on line. Closed cars were imported and commercial bodies were produced by small body building shops in each state.¹¹³



Fig. 6.35
1925 Ford T “Dalgety” Touring body.
P Kable

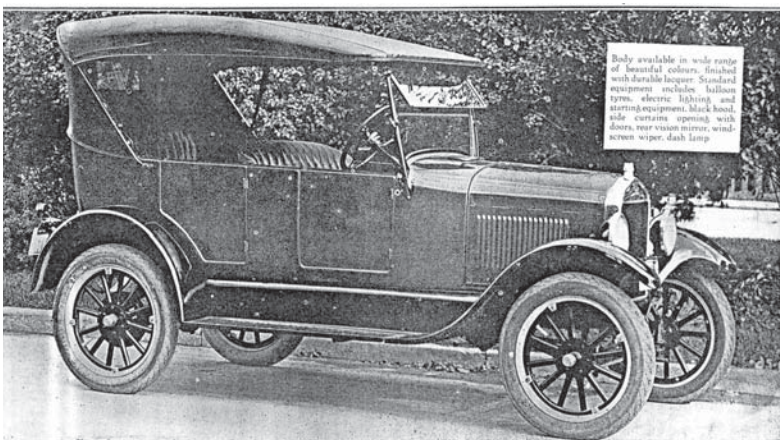


Fig. 6.36
Left. 1927 Ford T Touring body built by Ford Australia.
P Kable

Melbourne Motor Body Company (MMBC)

Following the embargo on motor bodies in 1917 Tarrant's body company, the MMBC works, expanded from about 90 employees in 1920 to 200 by 1925 producing mainly Model T Ford tourers and roadsters at the rate of 1,500 per annum. The company claimed it was the largest in Victoria but compared to Holden, with a workforce of 600, it was relatively small.

With the retirement of Harry Paul in May 1921 as General Manager, MMBC hired two experienced men from America: E J Tiedemann replaced Paul as manager and W J Lamb was appointed his chief body designer. Tiedemann commenced his career in 1901 at the Springfield Metal Company works and by 1904 had produced an aluminium closed bodied car. In 1912 he moved to Rothschild & Co of New York as the works manager producing bespoke motor bodies, then to Milbourne Company of Toledo where he increased production by 900%. Finally Tiedemann moved to the Peerless Motor Company where he was the chief body designer and superintendent. Lamb learnt his trade with coach builder Vessey of Bath England and went to America to work for the American Body Company in Buffalo. He became the chief engineer of the US Aluminium Company and later was the Maxwell-Chrysler Corporation's body designer and experimental engineer. Prior to leaving for Australia, Lamb worked for Hayes Company as their chief engineer producing motor bodies for Flint and Durant cars. On arrival in Australia Tiedemann reorganised the body plant ordering considerable labour-saving machinery that lowered body costs and improved finish.¹¹⁴ By 1924 the company had outgrown the Little Lonsdale Street site and Autocar Industries (formed by Tarrant's as a holding company, see Fig. 6.34) embarked on an expansion in West Melbourne.¹¹⁵ The new factory covered three floors with each having access to street level and opened in October 1925.¹¹⁶

The Melbourne Motor Body & Assembling Company Pty Ltd was now a large body builder operating from Dudley Street, West Melbourne producing bodies principally for their sister company, All British Motor Co Pty Ltd, including Rolls Royce, Sunbeam and Armstrong Siddeley.¹¹⁷ In 1930 the company became known as Ruskin Motor Bodies Pty Ltd and the managing director, Percy L Strong continued in the role.¹¹⁸ The company gained two new designers, Joseph Corser in the role of chief body engineer and A L Spooner Jnr as the body designer.

Corser was an English body builder who arrived in 1912 and following the war trained returned servicemen at the Kew Soldiers and Sailors Motor Body Works and in 1921 was awarded an honourable mention in the Carriage, Waggon and Motor Body Builders Association drafting competition. ¹¹⁹

Smith and Waddington Pty Ltd

The history of this medium New South Wales body builder can be traced back to Henry and Richard May who ran a small coach building business in Parramatta Road, Camperdown. The brothers, together with their coach painter, Charles Leslie Fairs saw the potential of motor car bodies and in January 1920 registered May Bros., Body Builders Ltd, with a capital of £15,000. The venture did not go as planned and by February the following year a winding-up order had been made.¹²⁰ Not far from the May Brothers business, theatre entrepreneur Frank Waddington saw an opportunity to place his sons in a business. Waddington had arrived in Australia in 1878 from Bradford, Yorkshire. He was initially involved with the New South Wales Fruit Co-operative, holding the position of secretary from 1891 to 1900. By 1905 he was running the Talking Machine Co. and in 1910 opened a canvas theatre in Parramatta Road, Petersham, registering a new business as Waddington's Pictures Ltd.¹²¹ By 1916 Waddington had a string of theatres including the Globe, Glaciarium and The Grand.

In March 1921 Waddington, Fairs from May Bros. and New Zealand coachbuilder, Arthur Smith commenced Smith and Waddington and incorporating on 7 September 1922. The following year further capital was sought from Melbourne investor, Solomon Green, and a new factory erected near Missenden road, Camperdown. Smith and Waddington targeted the high end of the motor body business building bodies for Rolls Royce, Stutz, Crossley, Hudson, Berliet, producing small runs for Sydney distributors.¹²² By the end of 1923 the company claimed it had produced 85% of Australian Rolls Royce motor bodies, a claim backed by an order for seven new 20hp chassis in 1923.¹²³ (Fig. 6.37)

Smith gained such a reputation for designing high class, well-proportioned motor bodies, that local owners are said to have fitted UK based Hooper of London body plates in place of the Smith & Waddington one to improve the resale value of their Rolls Royce.¹²⁴ Photo albums comprising sketches and photos were produced to show prospective customers styles and designs. (Figs. 6.38 & 6.39) The firm also produced several buses and by 1925 could produce

60 small single deck buses in a four-month period.¹²⁵ Frank Waddington's son, Russell Waddington, became the General Manager in 1926 having previously managed the body building department. At the start of 1923 the company employed 150 workers and by the end of the year 200 were on the payroll.

In 1924 the firm decided to expand so that mass produced bodies could be made. This resulted in a new 26,000sqft factory being erected on the corner of Parramatta Road and Missenden Road. The new plant was equipped with the very best machinery and was again expanded in 1928 with a large modern press shop. Contracts were obtained for New South Wales deliveries of Hudson, Essex and Chrysler products. Production reached 25 bodies per day.¹²⁶ The firm had been restructured in April 1926 under the same name and plans were ready for a new four storey factory. Construction disrupted production between 1926 and 1928, with some fourteen different temporary premises being used to build bodies. A combination of cash flow and falling production forced a suspension in work in October 1927 although production recommenced in early 1928 with orders for Hudson, Studebaker, Erskine, Dodge, Essex and Chrysler in both open and closed bodies.¹²⁷ While profit was declared at £11,187 it was short lived and on 26 March 1930 receivers were appointed with the firm wound up in July.¹²⁸

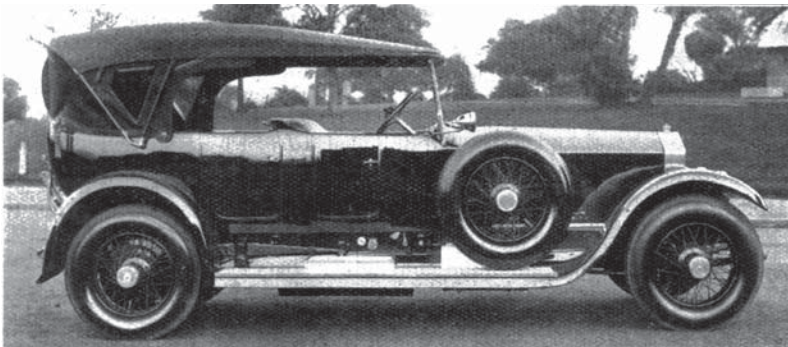
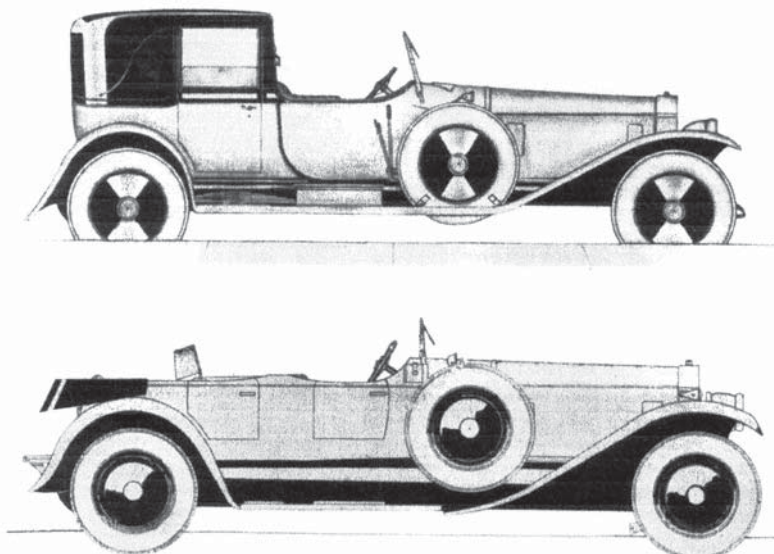


Fig. 6.37
1923 Smith & Waddington body for
Rolls Royce chassis.
Rolls Royce Club of Australia Archive



Figs. 6.38 & 6.39
Two 1923 sketches of Smith &
Waddington bodies for Rolls Royce
chassis.
Rolls Royce Club of Australia Archive

Summary

The period 1917 to 1925 saw unprecedented growth in the automotive industry and a handful of companies emerge as leaders in body building. While there were Australian companies such as T J Richards and HMBB successfully manufacturing motor bodies during the period, the world's largest auto companies, Ford, GM and Chrysler recognised the opportunities that the Australian market afforded and established manufacturing bases here either in partnership with Australian firms or alone. The transfer of technological and design knowledge from America to Australia strengthened the position of designers within these firms and the period witnessed the establishment of Australia's first body design and drafting office at Holden.

The role of body designer was strengthened with the establishment of Australia's first body design and drafting office at Holden and the employment of trained body layout draftsmen. Men trained here later took significant design roles in other Australian automotive companies. This is discussed in Chapter 8. Skill levels were maintained by at least one major body builder, Holden, through the establishment of in-house training.

Table 6.1 Imports of motor cars and parts thereof

Year	£'000	%	%	%	%
		UK	Canada	US	Other
1920/1	4238	20	14	60	6
1921/2	3058	15	26	41	18
1922/3	6632	11	31	48	10
1923/4	11001	12	19	61	8
1924/5	11603	18	11	63	8
1925/6	11978	22	8	65	5
1926/7	14178	24	8	65	3
1927/8	8257	17	3	77	3
1928/9	10677	14	18	67	1

Source: Forster, C 1864, Industrial Development in Australia 1920-1930, 34.

Endnotes

- 1 Nancy Buttfield, 1979, *So Great a Change* (Sydney: Ure Smith 1979), 185.
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Chapter 7: Consolidation & Innovation 1926 - 1938

Until 1926 the Australian auto industry was only capable of producing a crude mass-produced body that employed some high-volume production techniques but still largely hand-built. After that time, mass production using a mechanised assembly line that truly reflected standardisation was the norm. This section examines Holden Motor Body Builder's adoption of GM practices in design and manufacturing technique, and the emergence of body styling in other Australian auto plants.

In 1926 the Stylist had yet to be identified. Penny Sparke suggested the creation of the GM Art and Colour Section in 1927 created the concept of automobile styling as we know it today.¹

The trend of delivering the classic principals of proportion, symmetry and decorum occurred in Europe where classicism meant a strict observance of the rules. Mercedes-Benz with its functional lines is best illustrated in the 1908 Blitzen racing car and subsequent SSK 2-seater 38/250 V style radiator, sports phaeton, first introduced in 1914. (Fig. 7.1) Shape was not what drove auto companies like GM to create styling studios, it was colour, or colour harmony to be precise.

While it was usual practice for GM to establish their own design and manufacturing facilities abroad, either by starting up, more commonly, or by purchasing an existing enterprise, it was not their practice to sign an agreement with an external firm. Making an agreement with HMBB placed Holden in a unique position, but not one that didn't cause a few headaches.²

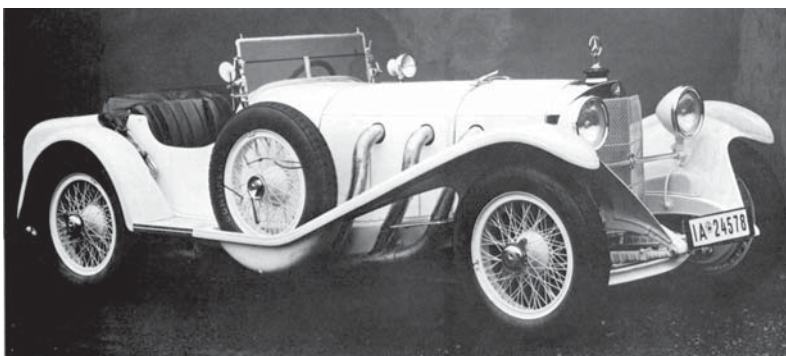


Fig. 7.1
Mercedes SSK 2-seater
Mercedes-Benz

This chapter explores the maturity of the Australian automotive designers and the willingness for GM and Ford to foster a local body design effort that allowed new body styles to evolve. Alongside the body designers were several engineers who explored innovative and marketable engine and transmission designs, these designers are identified and their efforts discussed.

I argue that the maturity of Australian auto design in this period produced two unique styles, the coupé utility and all-enclosed coupé. The success of these designs gave the Americans confidence that the locals could be left alone. I also argue that GM-H led the Australian design effort. They established a number of firsts in this country: an automobile drafting office, training of layout draftsmen, encouragement of experienced layout draftsmen to teach their skills in institutions and the establishment of a styling centre. The company encouraged draftsmen to enter competitions and were quick to despatch designers and engineers overseas to learn new techniques.

Automotive design drafting

At the commencement of the period (1926) the automotive designer had yet to be identified in Australia. While evidence exists of early motor body builders producing a design on a blackboard (see Fig. 3.17 in chapter 3) actual motor body engineering drawings and designers sketches are scarce. Australia lacked the specialised high-end coach builders that existed in America and Europe where automobile artists prepared elaborate coloured sketches for customers. In Australia the coach builder produced a body for a motor agent, not directly for an individual customer. The closest Australian coach builders to the European and American specialist builders were the firms of James Flood & Co, Smith & Waddington and Martin & King. These companies were far removed from the activities of overseas bespoke body building firms like Mulliner, Brewster & Co, Dietrich Inc, Walter M Murphy Co, Hooper & Co and Vandenplas.³

The first evidence of an Australian automobile draftsman is the hire of Herbert Wylie by Holden in 1923.⁴ Wylie had returned from America following three years of training and practice as a layout draftsman. Initially learning the trade at Fisher Body in Canada and then Ford America, Wylie returned to Australia to become Holden's leading draftsman

and drafting trainer. The drafting process Wylie brought to Australia can be traced back to the Industrial Revolution, when engineers Matthew Boulton and James Watt found a need to bring discipline into their newly created steam engine factory in 1773.⁵ The French shipbuilders took the discipline further, developing a three-dimensional lofting method that Albert du Pont taught to the carriage industry in his Paris DuPont school in the late 17th century. Coach builders had only drawn in two dimensions; learning to plot on three-axis or planes meant every inch of the body surface could be drawn mathematically.⁶ An American, Andrew F Johnson, won a scholarship to the DuPont School in 1884, learnt the French method and returned to teach it at the Technical School for Carriage Draftsmen in New York. (Fig. 7.2) His pupils included the Fisher Brothers, Herman Brunn,

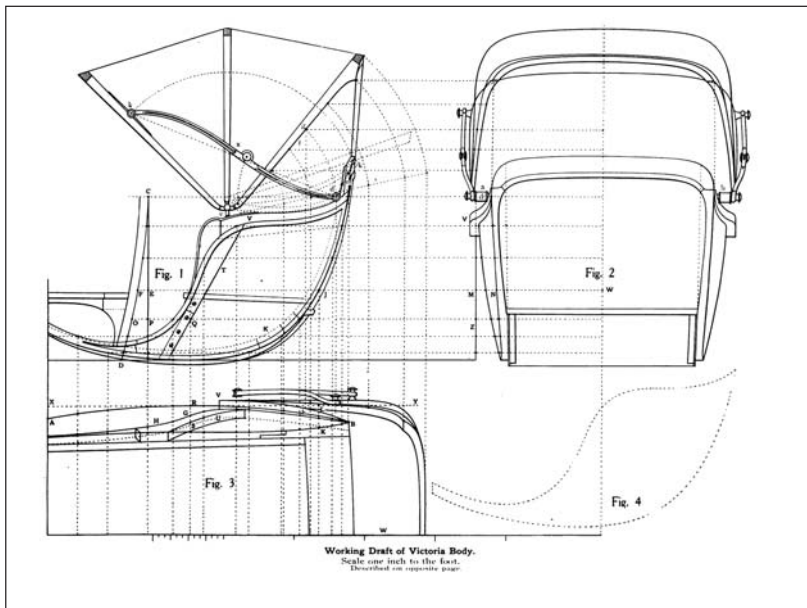
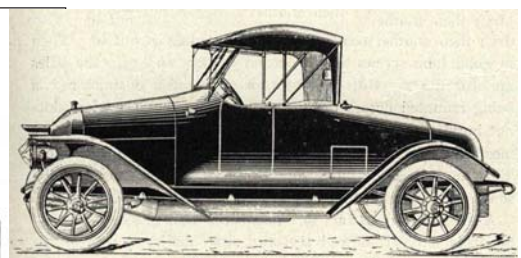
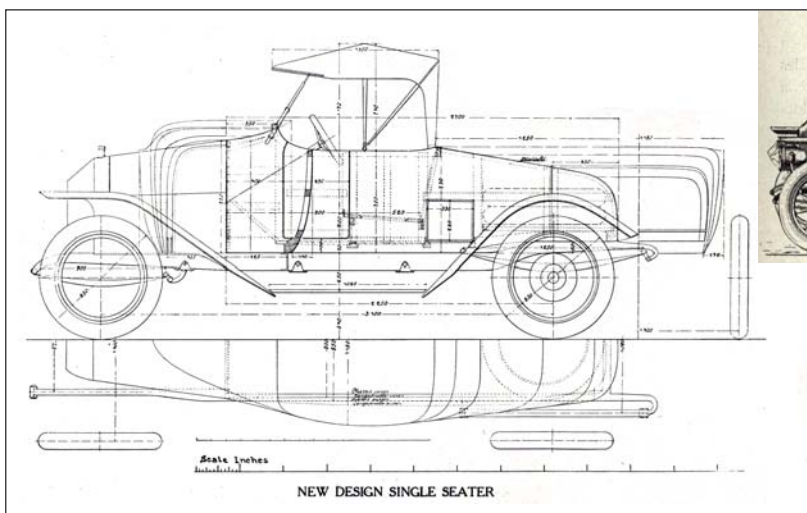


Fig. 7.2
A Cant draft from the Johnson School of Drafting 1906 showing the three views, side, end and plan of a two seater body.
The Hub 1906, 294



Figs. 7.3 & 7.4
Australian sketch and draft of a two seater roadster published in the Australasian Coachbuilder. The design shows a layout with sections drawn over the side view.
The Australasian Coachbuilder & Wheelright February 1913

Ray Dietrich, Charles Nash and William Durant.⁷ A principle behind the French method was drawing vehicles to scale using the French or $\frac{3}{4}$ inch to 1-foot scale. The Society of American Engineers adopted a standard $\frac{1}{2}$ inch scale, even though coach builders usually stuck with the $\frac{3}{4}$ inch to 1-foot scale. From a scale drawing a full size, chalk outline was made, and from this, patterns could be traced. The three views, plan, side and end were known as a Cant. Sections were drawn over the three views. (Figs. 7.3 & 7.4)

In 1912 Americans Birge & Sargent demonstrated horizontal lines as an aide to developing a surface shape by dividing the side view into six parts, numbered 1 – 6 and I – VI (on end views). One was at the top of the body and six at bottom. The vertical lines varied in width depending on the amount of sweep or twist in the body, the more sweep the closer the lines. From these lines the draftsman could develop the curved surface of the panels, as dimensions were still developed from a scale.⁸ (Fig. 7.5)

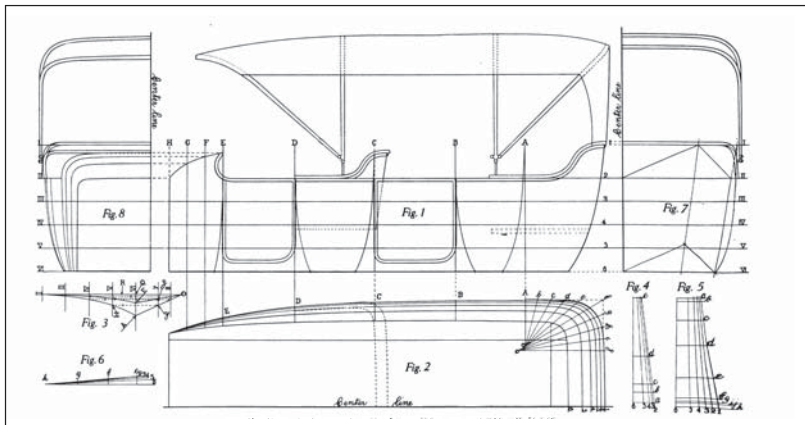


Fig. 7.5

1912 draft of a touring body with horizontal lines drawn to aid scaling and the development of curved or twisted surfaces as proposed by Birge & Sargent.

Practical problems for vehicle draftsmen and mechanics, 35

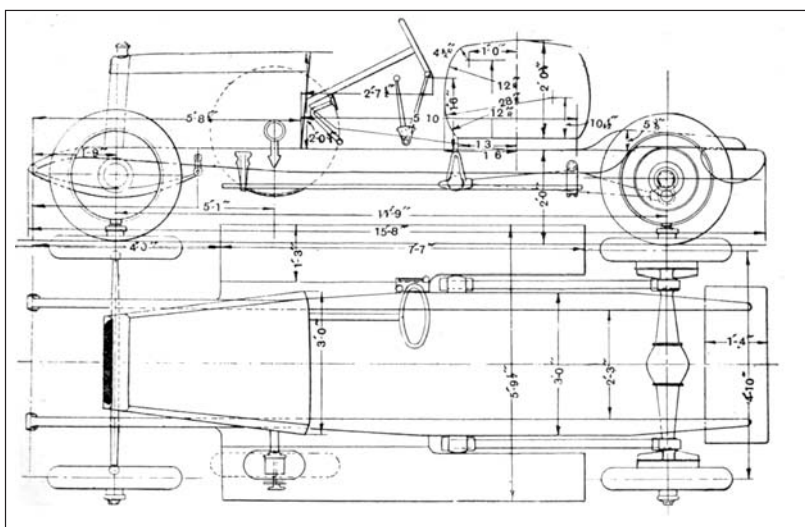


Fig. 7.6

Manufacturers Working Drawing for an English Lanchester car 1920.

The Automotive Manufacturer, The Hub, April 1920, 11

The layout drawings described are not to be confused with a Bodymaker's Working Drawing that was supplied by a manufacturer of the chassis to provide vital information on the chassis dimensions such as wheelbase, chassis rail dimensions, firewall location, wheel diameter, steering wheel location and overall length. (Fig. 7.6) This drawing provided advance information to a body builder on how a body would integrate with the chassis and its mechanical components.⁹

The advent of the metal automobile body required further precision, leading to vertical lines being projected over the drawing at scale intervals. From these drawings a developed surface could be drawn, enabling a pattern to be made of the exact shape of the raw panel.¹⁰ George Mercer¹¹, a Johnson student, took layout drafting further, teaching the 10-inch square grid method from about 1918.¹² The grid method was quickly adopted by American designers as it reduced errors; the British continued to use scale drawings. (Fig. 7.7)

Fully dimensioning a layout drawing, with compound curves was near impossible. A scale assisted but paper drawings were subject to moisture, allowing the paper to grow as it absorbed water. With a grid, only the last part of the drawing had to be scaled, then the number of 10-inch squares were added. The grid system also dictated that layout drawings were full size. Holden moved to this method of drafting in 1924 when corporation layouts began arriving for the new 1926 GM models. By contrast, it appears the British coach builders took longer to adopt Mercer's grid practice.¹³

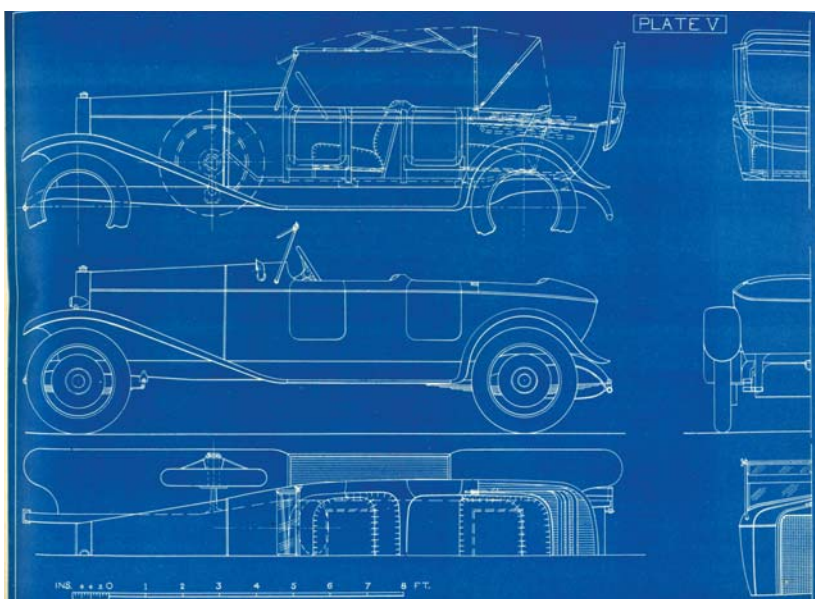


Fig. 7.7
An English body builders
blueprint of a 1912 torpedo
body on a scale of 1/2 inch to
the foot.

**Herbert Butler, Motor
Bodywork, opp 28**

By the early 1950s the British car industry was using gridded drawings, a major difference being Mercer dictated that 0 grid line in the side view was located at the firewall, whereas the British located the 0 grid line on the front axle centreline. This practice, adopted by smaller body shops, flowed into larger drafting offices like GM and Ford, some even placing 0 in front of the car so that there were no negative dimensions.

It was Mercer's 10-inch grid layout drawings that Wylie brought to Holden in 1923.¹⁴ (Fig. 7.8) No drawings from this era have been discovered to date. The earliest example of GM-H layout work is a drawing by Woodville draftsman, J (Jack) Dunn. His 1939 entry in the Australian Coach Body drafting competition shows a coupé utility on a 106-inch wheelbase. Dunn won the junior section with his work. (Fig. 7.9) A year earlier, P W Thorne, also from GM-H Woodville, won the junior section with an un-gridded drawing of a sedan.

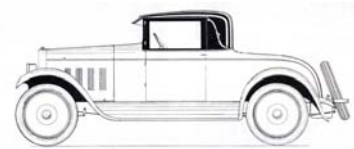
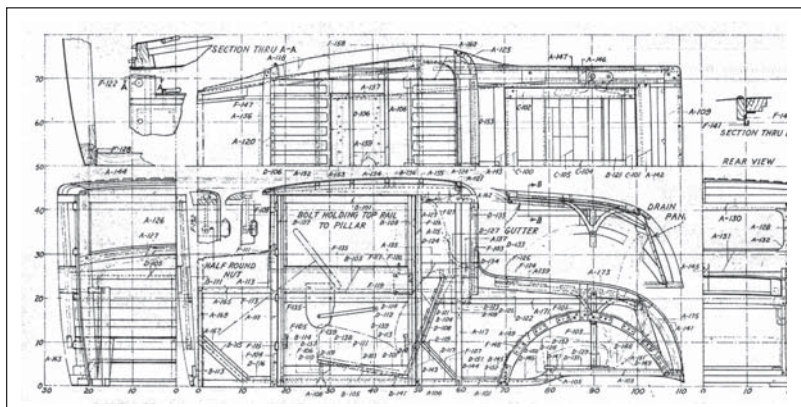


Fig. 7.8
George Mercer's 10-inch grid drawing for a 1926 coupé body. This draft shows all the wooden pieces (labeled) required to produce the body. Part of the Mercer drafting lessons. Sketch above illustrates the finished body.

The Coach and Motor Body Builder, December 1926

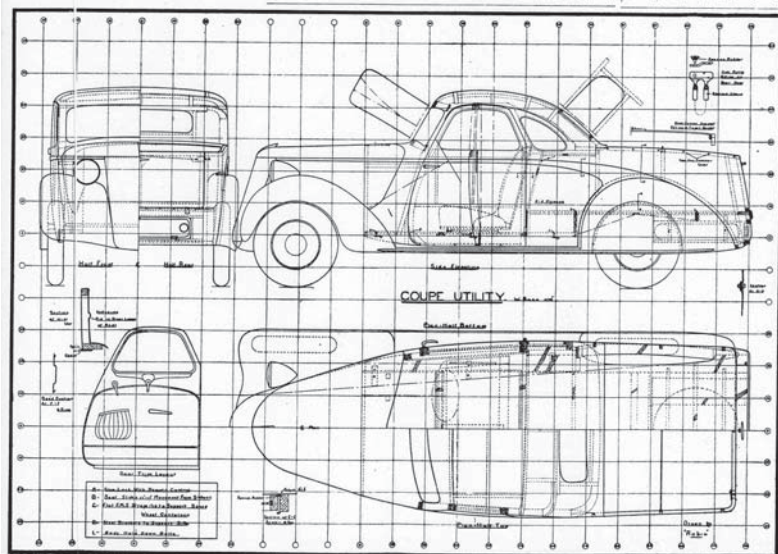


Fig. 7.9
GM-H draftsman, J (Jack) Dunn prepared this layout in 1939 as part of a drafting competition. Drawn on a 10-inch grid but to scale to meet the competition guidelines.

The Coach & Motor Body Builder September 1939

By 1928 Holden had built a new engineering drawing office in the Woodville Plant with eight large layout tables and a blackboard large enough to draw three full-size outline drawings. In America from about 1926 aluminium sheets (plates) were used to record the layout, lines were cut into the white painted plate and coloured. Tracings could then be quickly and accurately made.¹⁵ This process did not reach Australia until 1945 as part of the Holden development process at GM-H.¹⁶ The move to metal layout sheets coincided with a change to a 5-inch grid at Holden, in line with GM practice. The 0 grid line in the side view was also moved to the centre line of the front axle. A second change in 1945 was the separation of views, the side, plan and end views were now drawn on separate plates.

The GM agreement

Signed in late 1923, the GM-Holden agreement with the GM Export office took a while to be fully effective. The first part of the agreement was for the total output of the Holden Woodville plant to be used exclusively for GM chassis, this occurred in 1924. In the interim, technical data began to flow into Holden from GM. The first data came via Edward Riley, who came with:

Trunk loads of cards, forms etc relating to factory control systems and parts lists and drawings. For the first time we were introduced to part numbering, and general factory control.¹⁷

Edward Holden recalled that it took many years before the old hands fully accepted that the changes were a good thing. The changes implemented with Riley's data partly resulted in Holden lifting their production from 6,600 bodies per annum in 1922 to 32,000 in 1925 and for seven months in late 1926 production ran at 4,000 bodies per month.¹⁸

With Woodville online, Holden were expected by GM to produce bodies that were essentially the same as produced by Fisher Body. The first body to be attempted was the 1925 Chevrolet and it was achieved using a new Forward Downs 250-ton press. This enabled the rear wheel house quarter panel to be pressed from a single piece of steel with a 2-inch-deep flange and curve to join the back panel. For the 1926 Chevrolet, model changes were made by adding a 2-door coach style that Holden were expected to follow.¹⁹

A problem for GM in Australia was the final assembly of their cars. In the case of Chevrolet, bodies were shipped to the Holden assembly plant in South Melbourne and installed on a chassis that had been put together nearby by South Australian Cheney Motors from CKD parts. Holden would then finish painting the car and deliver to the selling agents. In every state the various agents had their own assembly shops, all doing it differently. On 6 May 1926 General Motors (Australia) Pty Ltd (GMA) was registered in Melbourne and plans announced to erect five assembly plants in Melbourne, Sydney, Brisbane, Adelaide and Perth. Several of the distributors were upset, despite being well compensated. Cheney, for example, handed his Chevrolet Victorian business to Robert Lane in Melbourne, taking a Morris dealership while in Adelaide, Vivian Lewis Ltd took over the Eyse & Crowie Ltd Buick business.²⁰

One effect of the formation of GMA was the creation of a small engineering department in the South Melbourne office. This group essentially controlled the assembly engineering but also began to produce designs for single order commercial bodies. Leading this group was Cliff Kaye, a young civil engineer who happened to work in the same building as the GM Export Office (later the GMA office). Kaye joined the Export Company in late 1925, automatically transferring to GMA where he oversaw the layout of the new assembly plants. He previously managed the Melbourne School of Mechanical Drafting and was the Chief Draftsman at Dunlop Australia.²¹ Kaye was joined by former Forward Downs draftsman Geoff Roper and the pair produced a range of specialist commercial bodies. As Holden continued to grow they purchased additional equipment costing £470,000, which included a large 500-ton Hamilton press for stamping cowls and a Toledo door panel press, that were installed in 1928.²²

This period also marked the employment of new design personnel, including Holden's first female designer, Barbara Sandford. We would know little of Sandford's employment if it had not been for Ford Australia's decision to hire Sydney Ure Smith and friends to develop the improved A Ford colour scheme for the 1929 release. All major dailies, featured stories and images of the artists, Smith, Thea Proctor and George Lambert, who were paraded with the new Ford roadsters and tourers at the Sydney Ford plant in December 1929.²³ (Fig. 7.10) The choice of artists was inspired, Smith and Lambert were well known and Proctor provided editors an edge for their female readers. It is likely that Proctor did the actual work on the



Fig. 7.10
 1929 Improved A Ford model range depicted in colours developed by Smith, Proctor and Lambert.
 Ford Motor Co. (Aust)

colours as *The Mail* said her:

Versatility is proved by the success which attended the efforts in this new work. Her creation of a girls sports model - canary yellow body with blue mouldings, black fenders and red trimmings - is particularly noteworthy. Lemon, petunia, and red are dominant shades in the cars painted at her dictation.²⁴

Sandford was about 33 when employed by HMBB to: “take charge of the colour research department at the Woodville plant”.²⁵ At this time the process of Colour Harmony was in vogue and had been pioneered in the auto industry by Du Pont. It is possible that *The Register* newspaper, when receiving the Ford announcement, contacted Holden to determine what they were doing about Colour Harmony. Thus, on 19 December 1929 *The Register* was able to print not only Ford’s story but the fact that Holden

also employed a woman to develop colour harmony. Holden then followed up Ford's story with their own, providing papers with a photograph of Sandford, an: "English woman working with interior trim materials". The Advertiser also reported that Sandford:

....actually creates the styles instead of having them slowly evolved by criticism. Not only does Holden's colour harmonist dictate the exterior colour of the body, she goes further by selecting the interior trimmings, garnish mouldings, and even the tassels and blinds.²⁶

Sandford's work appeared on the 1930 Chevrolet and Buick models that were released at the end of January 1930, displaying according to *The Register* complete harmony between the exterior paint work and the upholstery.²⁷ Whether she had any influence on the earlier models is not know. The late 1926 Superior V Chevrolets tourers and roadsters, for the first time, offered two tone colour schemes; these expanded into seven colour schemes with contrasting mouldings and pin striping.²⁸ (Fig. 7.11)



Fig. 7.11

Left. 1927 Two-tone Chevrolet tourer. Featured two colours for the first time with black fenders and valances and highlight pin stripe. This was one of seven combinations produced for Australian models.

N Darwin

Above. Compared to the American 1927 Chev colours they were more vibrant.

GM Corp. Chevrolet catalogue 1927



Fig. 7.12

Holden built Coach two-door body on a Chevrolet chassis. Single colour with black roof, mudguards and valances.

N Darwin

Holden led Chevrolet with two tone paint. Advance information of the 1927 models would have arrived in Woodville in early 1926 for release in April/ May 1927. As the 1926 models continued production Holden were able to introduce the two-tone paint earlier.

The colour separation was hidden under a black moulding bead on tourers and single pinstripe on roadsters. On the other hand, closed cars were painted one colour with black roof, mudguards and valances. (Fig. 7.12)

This colour harmonising would have required someone with Sandford's talents and it is, therefore, logical to accept she was involved in the selection of colours in this period. Certainly, there was no one else capable. There is no record of Sandford's art training, but she was unquestionably one of Adelaide's Society ladies. Often appearing in the pages of Adelaide's press, Sandford not only attended gala occasions but organised charity balls and the like. In 1930 Stanford was given the title Director of colour research.²⁹

The year 1927 was a turning point for car styling. It was the year colour became an important feature along with chrome plating and artistic radiator shells.³⁰ The Australian Vauxhall also featured two-tone paint in five schemes. All this was made possible by the introduction of Duco paint by Du Pont that replaced slow drying enamel. In the 1920s the biggest problem for auto makers was finding a paint to dry in a speedy manner. Coach builders using enamel paints usually had to wait three weeks for the paint to dry. When Henry Ford cranked up his T model production, three weeks of production waiting for paint to dry was not an option. Black paint had the quickest drying time which could be speeded up in a curing oven but with a wooden framed body it was impractical. In Australia, with warmer climates than Detroit, T Fords were painted mostly darker colours, but also greys whereas the US Ford factory only used black.³¹

E I duPont solved this problem by inventing Nitrocellulose lacquer (Duco). duPont worked closely with GM to exploit this new medium and by 1925 the Colourist had arrived. Du Pont also established a Duco Colour Advisory Service and sent H Ledyard Towle overseas to study colour trends. In 1925, at the Paris Auto Show, Towle found "all Paris was colour mad".³² GM had already taken the plunge on colour and painted seven 1924 Oakland tourers in the new lacquer using a colour called True Blue rather than the staid dark blue, green or grey hues. The cars were paraded around

America creating positive comment that led to GM introducing Duco paint on Oakland cars in March 1924 and by mid-1925 all GM lines were using Duco.³³

Towle's return to America coincided with the employment at Cadillac of Harley Earl, a young coachbuilder stylist. Earl was employed on the new small Cadillac, the La Salle, claimed to be the first production car anywhere to reflect the artistic influence of a stylist. Earle established the GM Art and Colour Section and was possibly the most influential stylist of the time.³⁴ In 1928, he employed Towle and with his team set out to visually streamline GMs new models. Du Pont's new paint flowed to Australia through BALM (British American Lead Manufacturers) in Sydney and by 1928 they were supplying all HMBB and other body manufacturers' needs.³⁵ The Chevrolet and Vauxhall colour schemes, while vibrant and striking, were no match for the La Salle paint that took advantage of Du Pont's colour pallet. Chrysler, through T J Richards, also adopted artistic colour tints in Australia, releasing in 1929 six shades of green, many of blue, maroon, greys and browns. The exterior colours were highlighted with black lacquer and a varied choice of upholstery.³⁶

In this period HMBB designers were active in promoting the strength of their motor bodies, particularly sedans. At trade stands a body would be tilted with wheat sacks loaded on the roof. Photos were released showing the strength of the door hinges by resting a loaded body on its door edges. (Fig. 7.13)



Fig. 7.13
1928 Adelaide Motor Show stand showing a Holden Motor Body builder's sedan body loaded with wheat bags.

The Australian Motorist.

The Depression and its aftermath

HMBB production fell during the first eight months of 1926 when the total output was initially all touring cars but from July, roadster and sedan bodies were added. By March 1927 production had reached a peak of 5,987 per month, then production levelled off at around 2,800 until May 1929 when it rapidly fell away to just 16 sedans, seven tourers and three roadsters built in August 1931. Recovery did not begin to recover until after April 1932, then slowly climbed to December 1935.³⁷

The major difference between pre-1932 and post-1932 production was the introduction of Woodville commercial bodies.³⁸ These commenced in October 1934 with the introduction of a fully enclosed Holden truck cab (tapered door cab), wholly designed in Woodville and first fitted to the WT Bedford truck chassis and later (1935) the Chevrolet/GMC truck Chassis.³⁹ (Fig. 7.14)

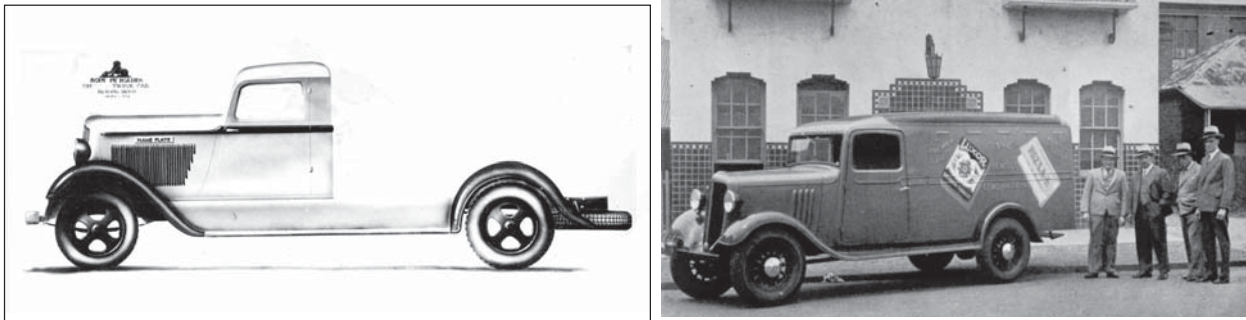


Fig. 7.14

Above. Holden tapered door cab styling drawing and right a panel van version built on a 1934 GMC chassis.

Holden Ltd



Fig. 7.15

Stoke Motors fabric bodied 1932 Chevrolet sedan.

N Darwin

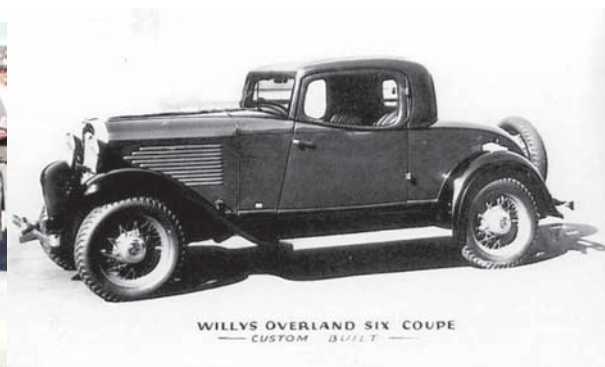


Fig. 7.16

Holden fabric roofed 1932 Willys Coupé.

N Darwin

By 1928 the engineering group comprised about 10 personnel, Norm Pointer - engineer, Wylie - chief draftsman, Charles Phillips, Roy Rainsford, Val Stacey, Tom Wylie - draftsmen, Reg Hall - junior draftsman, Sandford - colour and trim, a specification person and two or three model builders, all working under the Development Engineer, James Kingston (King) Stuart.⁴⁰ The group survived the Depression years, Hall recalling they worked one week on one week off, then one on and two off.⁴¹ Following the purchase of HMBB shares by GM and the renaming of the company to General Motors- Holden's Ltd, the engineering team grew. The small group, led by engineer Kaye in the Melbourne GMA plant, joined GM-H, and this area continued to control assembly engineering operations and design low volume commercial bodies. The commercial body design commenced in late 1927 at the GMA plant in South Melbourne with the release of the Chevrolet LM 1-ton chassis. The plant manufactured both the half door cab and five different tray styles.⁴² The Melbourne commercial plant manufactured around 5,000 bodies between 1928 and 1940, some production runs reaching 500 units.



Fig. 7.17
Martin & King bodied 1931 Chevrolet
Doctor's Coupé.

N Darwin



Fig. 7.18
Martin & King bodied 1931 Chevrolet Moonlight
Coupé.

Holden Ltd. 1931 Chevrolet catalogue

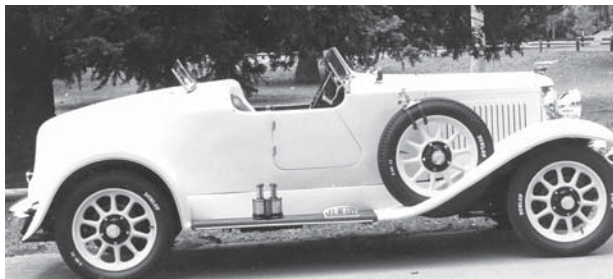


Fig. 7.19
1929 Vauxhall Hurlingham Speedster.

I Ward

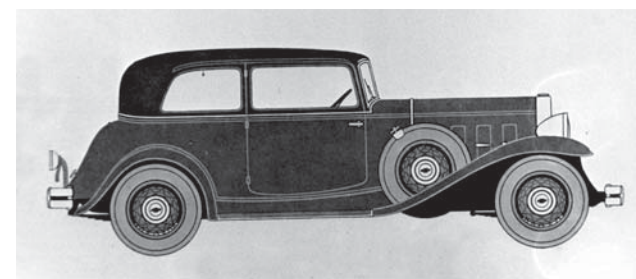


Fig. 7.20
Flood bodied 1932 Chevrolet Moonlight
Coupé.

Holden Ltd, 1932 Chevrolet catalogue

The depression period created both problems and opportunities for body builders. Previously reluctant to diverge from a standardised body, Holden took orders for fabric bodies between 1928 and 1931 for Essex, Morris and Austin. A lone Chevrolet was produced by the distributor, Stoke Motors. (Fig. 7.15) Holden also built fabric padded roofs on coupé models for Chevrolet, Vauxhall and Willys in 1931/32. (Fig. 7.16) At this time the Charles Weymann designed fabric-over-wood body was in vogue but required a very different method of constructing the wooden frame.⁴³ Few Australian body builders, including Martin & King, attempted to build in this style; it was impractical in the harsh Australian conditions. From 1930, desperate to move unsold stock, GMA were able to sell chassis to any bodybuilders as they had cancelled Holden's exclusive contract. As a result, firms like Martin & King built a unique Doctor's coupé on the 1931 Chevrolet chassis and Flood built the 1932 Moonlight coupés. (Figs. 7.17 & 7.18) Firms outside the GM organisation always had access to the commercial chassis and several niche companies made panel vans, utilities, hearses and ambulances.⁴⁴

GMA marketed two sporting bodies on the 1931 Chevrolet chassis. The open version was based on Vauxhall's Hurlingham Sports Roadster and named a Moonlight Roadster. (Fig. 7.19) A Vauxhall Hurlingham had been landed in Australia in 1929 and put on show in May 1930. Charles Phillips of the Woodville design office modified the Hurlingham body drawings to suit the 1931 and 1932 Chev chassis, then Holden contracted Martin & King to build the Hurlingham design to suit the shorter Chevrolet chassis.⁴⁵ (Fig. 7.20) The 1931 closed version, named a Moonlight coupé, was also made for Holden by Martin & King, although the following year



Fig. 7.21
1924 Millar bodied Chevrolet Utility.

D Perry



Fig. 7.22
1928 A Ford Utility

Ford Motor Co (Aust)

Holden completely revised the Moonlight coupé as a 2-door 4-seater that was produced at Flood's plant.⁴⁶

In 1933 design work commenced on the coupé utility. Two versions were built, the first on the Chevrolet and Bedford BXC chassis and a second small body on the Vauxhall ASX chassis. By the close of 1934, 142 coupé utilities had been built, the commercial bodies numbered just four out of a total of 98 different body styles produced for 15 different makes.⁴⁷

The coupé utility

As the economy improved and sales returned, the designers began to look at improving their offerings. In 1934 Ford Australia quietly announced a new model, the Ford coupé utility, a commercial vehicle produced on a passenger car chassis. The concept was simple yet brilliant as it provided closed passenger car comfort with ½ ton load carrying capacity. The idea was a short step from similar offerings as early as 1924 that had soft top roofs.⁴⁹ At that time Millar Bros body works in Sydney were making a light delivery roadster with a panel that extended from the tailgate to the door lock pillar. (Fig. 7.21)

In 1927 GMA produced a similar body for the Chevrolet passenger chassis at their Commercial body plant in South Melbourne, describing it as a passenger utility.⁵⁰ This was followed by Bolton's body works in Fremantle and Egan's body builders of Geelong who built four different styles on the 1928 Ford passenger car chassis.⁵¹ (Fig. 7.22) What made these utilities so different to the American equivalent was that the side of the utility component was also the side of the passenger component. In American utility bodies, known as a pick-up or buck-board, the goods carrying component was always separate.⁵²

Prior to 1926 engineer George Hamilton-Grapes published a design for a Utility Motor Body utilising a chassis for general utility passenger and commercial motor vehicles.⁵³ (Fig. 7.23) No evidence that this streamlined boat-tail body being built exists. So unusual is the utility style in the international sphere that texts rarely describe it. The *Illustrated Dictionary of Automobile Body Styles*, for example, does not have an entry under either utility or ute, as it has become known in Australia.⁵⁴

From a roadster utility to a coupé utility is not a great leap in thinking, so when Ford's body designer, Lewis Bandt, was asked to create a closed passenger utility he did not need to look far for inspiration.⁵⁵ (Fig. 7.24)

Much has been made of the uniqueness of the design, Michael Bogle citing Bandt's design as Ford's famous 1934 Ford utility; however, international design writers like Sparke, Lamm, Lucie-Smith, give the design no credit.⁵⁶ Bandt described the process of creating the design as:

A letter came down from Managing Director to sales, to Finance and on to the Production Superintendent, who asked Body Engineer "could it be done?" The Designer, feeling this was a "luxury" request that would soon pass away, found on putting that thing on paper that a surprisingly good balanced vehicle came up. "Build one" was the order.⁵⁷

Bandt commenced the work in October 1933 and the utility went on sale in July 1934. Bandt did the design work and draftsman, A Scott, prepared the drawings. These two men appear to have been the only design personnel in Ford engineering in this era.⁵⁸ (Fig. 7.25) A comparison between the Ford and Holden coupé utilities shows very little difference except that the Ford was based on the 5-window coupé and the Holden on a 3-window coupé. (Figs. 7.26 & 7.27)

In 1937 as a senior draftsman, Bandt won the open class in the first Australian Coach & Body Building competition. Bandt's entry was a large American style car on a 142-inch wheelbase drawn using ½ inch to 1-foot scale on a 20-inch grid, possibly due to the small size of the finished drawing (240 inches x 100 inches). (Fig. 7.28) This competition in 1938 produced an entry by C Rufus, a T J Richards draftsman, who styled a sloping utility roof later proposed by Bandt for the cancelled 1941 Ford coupé utility. Bandt also produced a scale clay model of the proposal and during his career Bandt won three international design awards, 1937, 1947 and 1948. (Figs. 7.29 & 7.30)

Bandt's next competition entries, in the British Carriage and Automobile Manufacturers' Automobile Body Design Competition for 1947 and 1948, gained 3rd place medals. The entry for 1948 shows a much smaller sedan on a 108-inch wheelbase. (Fig. 7.31) Given the date, perhaps this was Bandt's offering of a local Ford 6-cylinder car to compete directly with the Holden. The drawing shows a chassis indicating Ford were not considering unitary constructed vehicles at this time. Bandt was not the only Australian entrant; Arthur (Ray) Herring, a GM-H draftsman, also gained a

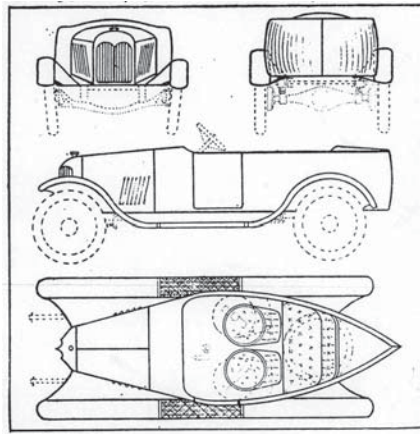


Fig. 7.23
George Hamilton-Grapes,
Utility drawing 1925.
The Australian Motorist

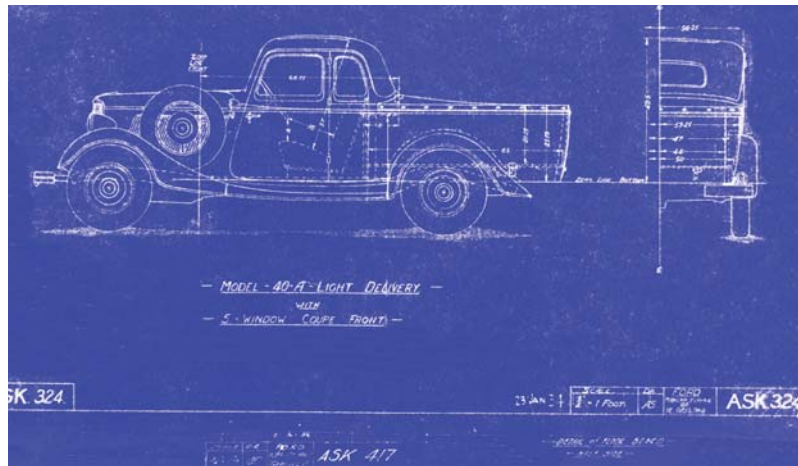


Fig. 7.24
Blueprint of the Ford Coupé utility prepared by Lew Bandt on 23
January 1934.
Bandt archive SLV

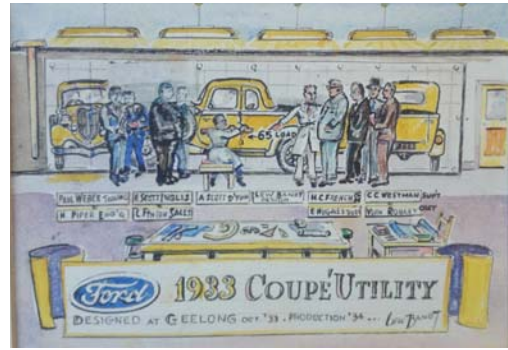


Fig. 7.25
Drawings by Lew Bandt following his retirement depicting the Coupé utility and the team that
produced it.
Eddie Ford - Restored Cars

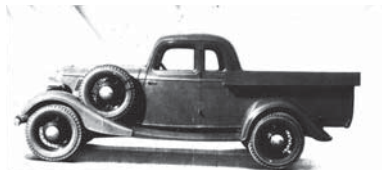
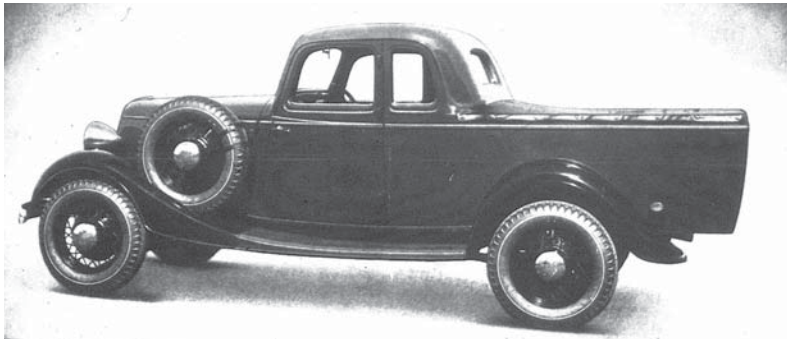


Fig. 7.26
Left. 1934 Ford coupé utility
with a tarp.
Above with well sides.
**The Australian Motorist May
1934**

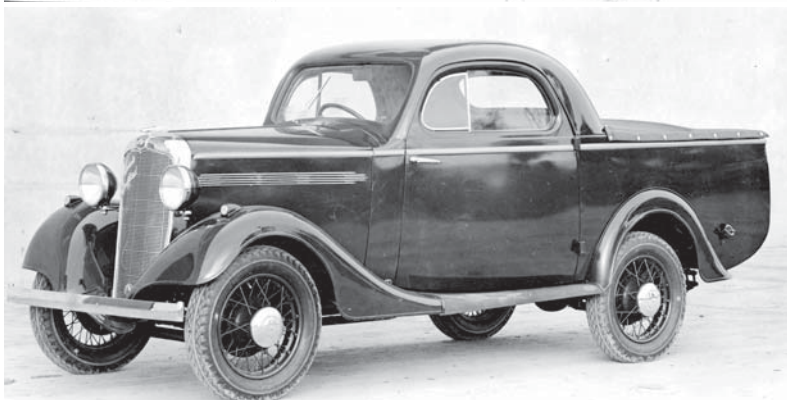


Fig. 7.27
Holden coupé utility on a 1934
Bedford ASXC chassis.
N Darwin

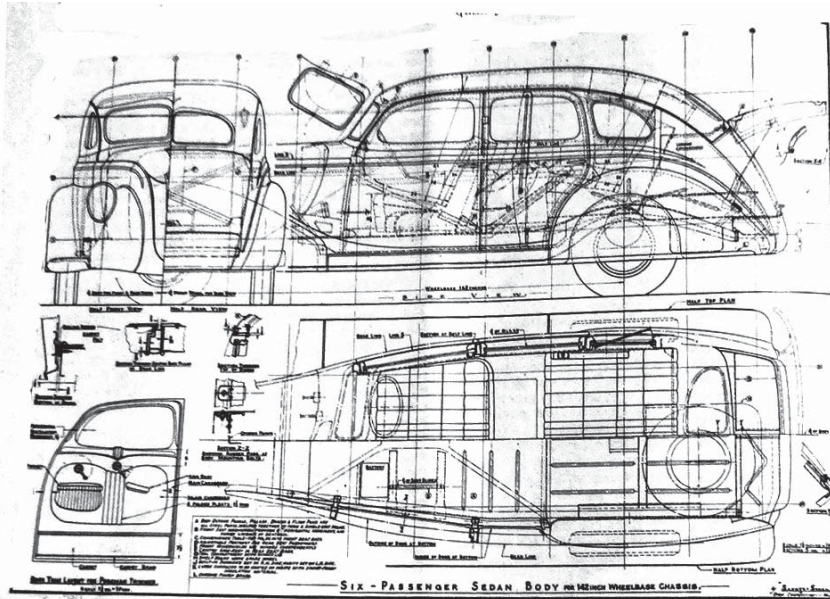


Fig. 7.28
 Lew Bandt's entry in the 1937 drafting competition.
The Coach & Motor Body Builder

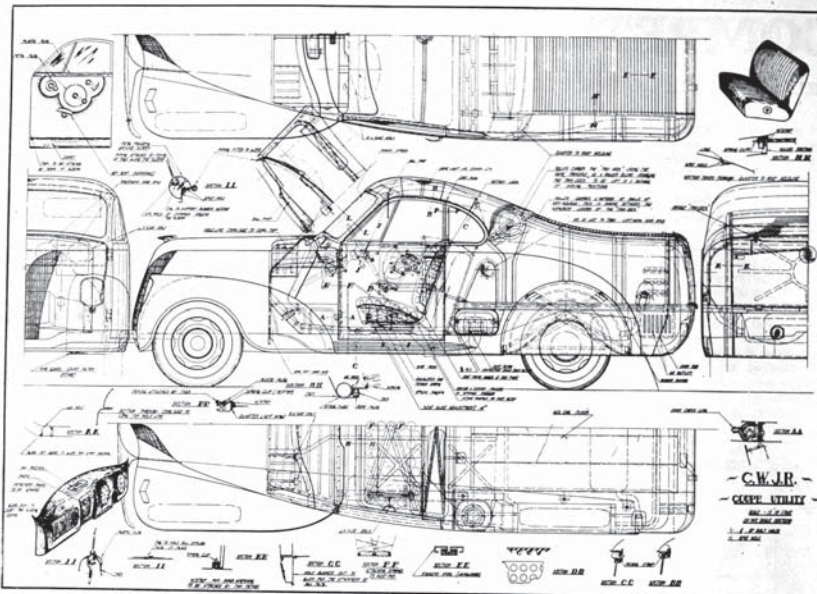


Fig. 7.29
 Above. Lew Bandt's clay model of proposed 1940 Ford coupé utility bears a strong resemblance to C Rufus's 1939 drawing entered in the drafting competition.
State Library of Victoria

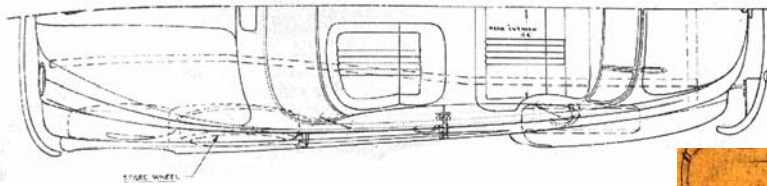


Fig. 7.30
 Left. C Rufus competition drawing.
The Australian Coach and Motor Body Builder September 1939

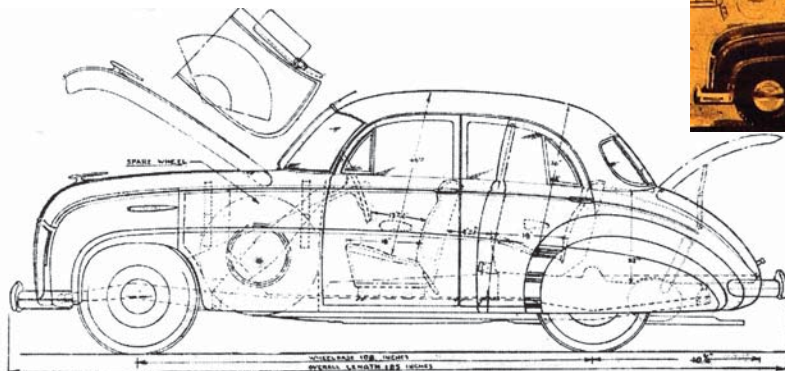


Fig. 7.31
 Lew Bandt's entry in the 1948 English drafting competition comprised a sketch and scale drawing.
The Coach and Motor Body Builder November 1949

third place in the low volume section in 1948, Herring trained under Bandt in 1941, later becoming Holden's drafting trainer.

Rather than follow Holden's all new approach, Ford Australia adopted a gradual increase of local content on the Canadian sourced Ford V8 and English sourced Prefect and Anglia. Anglia's touring bodies were produced by Martin & King and larger Prefect saloons were either landed fully assembled or assembled by Ford using a local Ford Australian body. By 1950 the V8 Ford Custom had 80% local content. In 1951 the 6-cylinder Ford Zephyr was released with a 107-inch wheelbase and full chassis in attempt to provide a competitor for the 6-cylinder Holden. Bandt was tragically killed in his restored 1934 coupé utility on 18 March 1987.⁵⁹

Holden's coupé utility, fitted to Chevrolet and Bedford chassis from September 1934, followed the Ford design closely and Holden have been accused of copying. Both vehicles were developed at the same time to meet the same market demand. Hartnett claims he had a role in the development, but as he did not arrive in Australia until March 1934 there was little opportunity for him to play a part. Hartnett suggests the design came from the South Melbourne plant: "John Storey (went to our) body service depot and asked the chaps to design a utility with a modern sedan-type front end".⁶⁰

Whoever made the first mock-up is incidental because the design would have required exact drafting at Woodville to prepare the large press tools, as the coupé utility bodies were all produced at the South Australian plant.⁶¹

Holden had produced this style, without the steel roof, since 1927, thus it is unlikely they copied it, particularly as they had a version released on the Chevrolet chassis by September 1934, just three months after the Ford saw light-of-day. Holden believed the design: "...was so apparent that a strong demand arose which was intensified by the development of new models combining appearance with utility".⁶²

The GM-H coupé utility was also produced on the Bedford chassis in two sizes. The style was quickly adopted by T J Richards for Dodge, Plymouth and Fargo. Small body builders like Webber in Melbourne produced versions that featured a join in the side panel since they did not have the capacity to produce a large pressing. The coupé utility design has appeared on a variety of makes: Holden, Ford, Bedford, Dodge, Desoto,

Fargo, Standard, Hillman, Austin, Armstrong Siddeley, Skoda, Peugeot, International truck and in the late 1950s on American models of Ford (Ranchero-1957) and GM (Chevrolet El Camino-1959).

The tapered door steel cab, announced in August 1934, produced in the South Melbourne commercial body shop, was capable of being used on commercial Bedford, Chevrolet and GMC chassis.⁶³ This cab was developed initially for military use as previous truck cabs were half door types, the door having no window frame or door glass. Cabs also tended to be wooden roofed or canvas covered. A second all-steel cab was developed at Woodville in 1934, initially for the large Bedford forward control WTL (long wheelbase version) chassis whose square door cab featured a roof ventilator.⁶⁴ In 1935 Woodville released a replacement all-steel truck cab for Chevrolet, GMC and Bedford, and this cab was distinguished by having three ribs on the all-steel cab roof.

Streamlining

In the early 1930s there was a move by designers to streamlining; the practise of smoothing motor bodies (streamforming) could be seen as early as 1913 when Giuseppe Merosi produced a teardrop shaped body on an Alfa Romeo chassis.⁶⁵ From 1934, the large auto companies began to look seriously at the aerodynamics of their vehicles. Chrysler made the Airflow body in 1934, Jaray established the Streamline Corporation and built the Tatra 77 and Norman Bel Geddes drew several innovative designs from 1932, influencing General Motors.⁶⁶ Sparke argues that Bel Geddes designs were a stimulus for others and that he had a “....tireless commitment to the world of the future, in which cars would show the way forward, this Sparke said could not be underestimated”.⁶⁷

In Australia designers largely ignored streamlining trends, automotive journalists noting:

The science of aerodynamics, as applied to the design of automobiles, seems to have been greatly neglected by most manufacturers of today's volume-selling vehicles, and the motoring public is (literally) the poorer for this neglect.⁶⁸

A difficulty for the Australian designers was they had no influence over the front of the vehicle because the bodies started at the firewall. This

only allowed the specialist builders to streamline the rear by sloping the body and sweeping out the tail. One Australian car that did embody aerodynamics was the Southern Cross. The brainchild of Jim Marks, the Southern Cross was based on a design by Mark's father, Arthur, who in 1923 had patented a monocoque constructed car using ply (see Chapter 5). In 1933 Marks formed the Marks Motor Construction Ltd in Sydney with Sir Charles Kingsford-Smith as a director. The ply body was covered with metal and two versions, an open tourer and a closed Airline sedan, were proposed.⁶⁹ The styling of the Southern Cross featured a split front grille covering the radiator which was laid back on an angle. The windscreen was also laid back and split to give some curvature (curved glass was not available). The door window openings were uniquely shaped and the rear roof swept down over a flush luggage compartment.

The only other streamlined Australian car in the era was built by Egan Sheet Metal and Body Works in Geelong. William Egan had built commercial bodies for Ford and turned to complete manufacture when his contract ran out. Just two Lycoming powered sedans were made. Egan also designed a patented fabric motor body for Morris Minors using thin strips of wood on a 3-ply frame over which he stretched calico that was then covered with aeroplane dope, sanded and painted.⁷⁰ (Fig. 7.32)

The Bishop brothers noted in 1936 that Australian body designers were in a quandary, should they follow European or American trends; continental designs were extreme and American moderate. They warned that in Australian conditions, ventilation versus the dust entry would be a nuisance and needed to be overcome:

We are inclined to sacrifice everything for appearance. The long extended tail on modern bodies creates an internal rotary movement of air, which must make for internal draw or suction.⁷¹

Their solution was a tapered tail breaking the vacuum effect as air met evenly under the rear tail lamp. (Fig. 7.33)

As General Motors-Holden emerged from the Depression, the Woodville design area began making changes to the American body designs. Prior to the merger between Holden and GM in 1931 the body building followed closely American styling. In 1933, when planning commenced for the

1935 model bodies, a decision was made to vary the Chevrolet/Pontiac/Oldsmobile 6-cylinder sedan body by minimising the number of individual panels. For the first time an Australian mass-produced body exhibited some streamlining. The decision to vary the American design was endorsed by Holden's newly appointed Managing Director, Laurence Hartnett.

In 1934 Holden produced a record 98 different body styles covering 16 different makes of car, an effort that required a high degree of engineering skill as the highest production body total for GM makes was 2,165 Chevrolet Master Sedans and the lowest, 10 Chevrolet coupé utilities.⁷² Of the non-GM makes, the highest production number was 1,573 Plymouth P/E Sedans and the lowest a single 10hp Morris coupé. As Holden said of this effort: "It called for an efficient and ingenious group of designers, engineers and tool makers".⁷³ (Fig. 7.34)

The number of different makes required Holden personnel to liaise with 12-14 chief body designers and chassis engineers not only from the GM makes but also Studebaker, Chrysler, Nash, Reo, Hudson, Austin, Morris, Standard, Willys and Hillman. For Hartnett:

The men at Holden's performed miracles of improvisation. In fact, their whole operation was little short of miraculous. It was unbelievable that they could get advanced drawings in May and have the new design off the production line in time to meet the new chassis imports – after the following January.⁷⁴

Holden continued to offer touring bodies through the 1930s, unlike GM's American models, Chevrolet, Pontiac and Oldsmobile. The low volumes meant they had to minimise the number of tools. This was achieved by having two basic bodies, one for 6-cylinder chassis (Fig. 7.35) and one for 8-cylinder. (Fig. 7.36) The Chevrolet sedan, for example, had no boot, just a spare wheel cover. To provide a longer wheelbase the cowl was widened and to provide a different outline, a boot added, and in the case of the Graham body it was squared off and for a Reo or Buick body it was rounded. Even longer wheelbase bodies could be produced on low volume cars like Cadillac and La Salle by lengthening the doors. (Fig. 7.37) Variations were also made to the side moulding and instrument panel; the sedan moulding was added as a stainless piece; the touring moulding was pressed. The rear end panel for the 6-cylinder sedan and tourer were

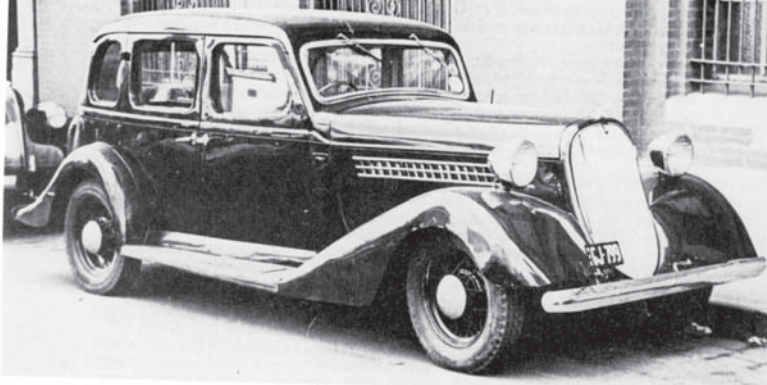


Fig. 7.32
1935 Egan Sedan.
H Paynting

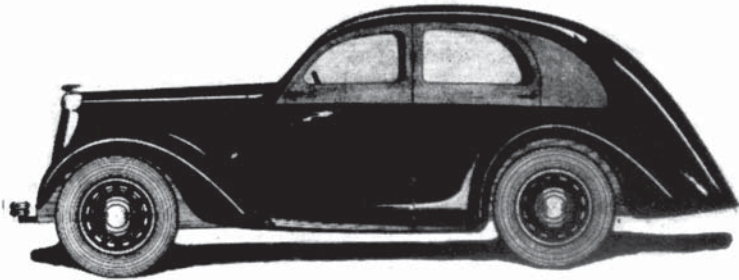


Fig. 7.33
Bishop Brothers sketch of
their solution for controlling
airflow over an Airline body.
**The Coach and Motor Body
Builder Dec 1936**

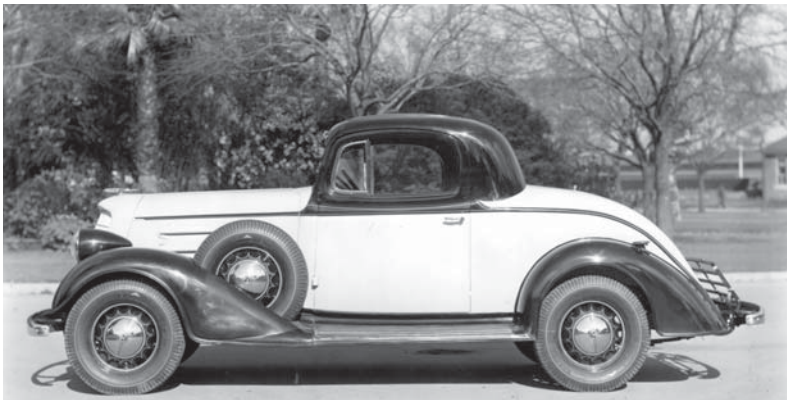
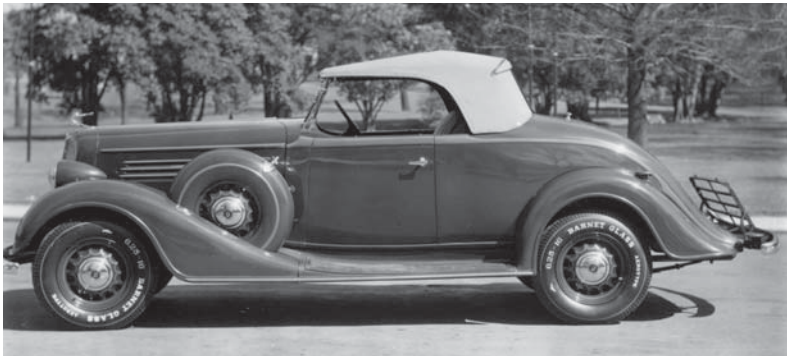


Fig. 7.34
Three Holden bodies on
American chassis, all closely
conforming to GM style and
body design in 1934. Buick
Roadster and Oldsmobile
Coupé.
Above Chevrolet Master Sedan.
Holden Ltd

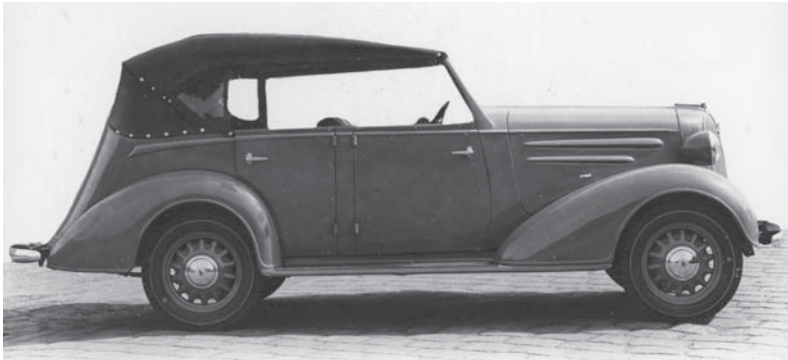


Fig. 7.35

Left. 1935/36 Chevrolet (Standard) Sedan and Touring body (left below) showing the rear swept out back. The sedan body was still produced using a wooden frame and canvas "island" roof.

Holden Ltd



Fig. 7.36

Left below. 1935/36 Long wheelbase sedan body fitted to Graham chassis showing the rear swept out back but with square boot style and extended cowl.

Above. 1935/36 Reo Sedan, same body as a Graham but with rounded boot.

Holden Ltd



Fig. 7.37

Above. 1935/36 La Salle Sedan on long wheelbase showing the rear swept out back but front and rear doors lengthened.

Holden Ltd

common. The designers who led this innovation in low cost tooling were Woodville chief engineer, King Stuart, body engineer Hartley Chaplin, chief draftsman Charlie Phillips, layout draftsman Wylie Jnr, Hall, Rainsford and Stacey. The Holden designers were also conscious of the need to design a body capable of withstanding the Australian environment:

To build a body to suit Australian conditions was always well in the thoughts of those responsible for design and engineering as they knew full well the conditions that cars would encounter in some of the 'outback' country, although today Australia is extremely well serviced with good highways, roads and tracks.⁷⁵

Holden were very close to producing all-steel bodies across the GM range for 1935/6, though two factors prevented this happening. The first was a late arrival in Australia of the 1935 Chevrolet chassis design drawings limiting the volume of the highest selling bodies, the other reason was a belief by General Motors Overseas Operations (GMOO) that Holden would be physically unable to make the Fisher Turret-top all-steel body for 1937. In 1936 GM wrote to Hartnett: "Now, with the advent of the all-steel body with a turret top the Australian Government should realize it will no longer be practical to make bodies locally in Australia".⁷⁶

The Detroit engineers were then stunned to discover Holden had built 480 Chrysler C6 and 1,891 Plymouth PJ all-steel bodies in 1935.⁷⁷ Holden then went on to manufacture the turret-top body for their 1937 models having installed a large 1000-ton Hamilton press.⁷⁸ The production of the Chrysler/Plymouth body involved multi-welding operations and with the help of Chrysler's engineers, a satisfactory body was made. Ford Australia designed an all-steel body for the V8 model in 1935, but like GM-H's body, it had an island roof.⁷⁹ Two large presses, a 900-ton Hamilton and a 1,319-ton South Bend were installed resulting in all-steel roofs on the 1937 Ford models.⁸⁰

The matter of local panel steel was still to be addressed by the steel producers. It had originally been promised by the Minister of Customs, in 1917, but nothing happened until an announcement in 1936 by John Lysaght that the new plant was to be installed in Newcastle.⁸¹ Finally, the Commonwealth Rolling Mills in Port Kembla produced the first sheet of panel steel in January 1939. It was cut up and handed out as a souvenir.⁸²

The Commonwealth Mills were established by the American company ARMCO and had been wooed by Hartnett who was keen to acquire local specialised steel suitable for unitary constructed bodies. Previously, from 1929, Lysaght imported two grades of panel steel. Designed for cellulose paint, it was made in two forms: type 22DD for deep drawn work and 22A for shallow panels like door skins and bonnets.⁸³ As production of pressed panel increased in the early 1930s, both Lysaght and ARMCO imported pressing steel from both their English and American mills.⁸⁴

The all-enclosed coupé

While the coupé utility body development has received some comment in automotive circles, the all-enclosed coupé or sloper as it is colloquially known, has been largely overlooked. The true coupé style was introduced as an enclosed fixed hood vehicle for a driver and one passenger. Some could also carry two passengers in an exposed rumble seat. Holden first built coupé styles in 1928 and from the early 1930s reversed the rumble seat lid hinges to create a boot lid, naming the style a commercial model. In early 1934 the Holden designers sought to provide an answer to a demand to: "Provide an intimate personal car with all-weather accommodation for occasional passengers".⁸⁵ The Holden press release noted: "The group of technicians – all of them young Australians, barely past threshold of manhood, were proud of their achievement".⁸⁶

The style made its debut at the Sydney Royal Easter Show in April 1935 on an Oldsmobile chassis as the Chevrolet chassis had yet to be assembled. A trimmed Chevrolet body was also on display and a Pontiac version was later released. The design extended the roof, in a single sweep, over the position of the rumble seat passengers and down, providing a boot and streamlined tail. This was only part of the design; the rear seat was hinged so that it folded down providing a load space from the back of the front seats through to the boot area. The folding seat mechanism was patented and many station wagons produced up to the 1970s adopted the patent. A large rear window had a lip-out mechanism to improve air circulation. This feature was dropped in favour of two fixed pieces of glass in early 1936. GM-H marketed the style initially on Oldsmobile, Pontiac and Chevrolet in 1935, then added Buick in 1936. Two versions were made, one for 6-cylinder chassis, and one for 8-cylinder chassis. (Figs. 7.38, 7.39 & 7.40)

Holden announced the new style with flair: “Originality ... for Australia’s sake” led a two-page feature on the coupé style in a booklet, *The Changing Trend – a story of Australia’s growing industrial independence* (1936).

Without questioning the knowledge and cleverness of other countries, the fact remains that Australia’s roads and geographical conditions, and special tastes, needs, habits and preferences of Australia’s public, provide unique problems. Australia’s motoring public is large – the problems demand and deserve solution – yet no country but Australia is interested or concerned to solve them.

It was natural that Australia should be compelled to take its place in the ranks of body builders in order to produce bodies built for specifically local conditions – strong to stand hard usage, beautiful in line, luxurious in comfort, perfect in finish – and of course safe.⁸⁷



Fig. 7.38
1935/36 6-cylinder All-Enclosed Chevrolet standard Coupé body.
Holden Ltd



Fig. 7.39
Oldsmobile six cylinder body was the same as the Chevrolet above.
Holden Ltd



Fig. 7.40
The 8-cylinder version fitted to a longer wheelbase Buick chassis
Holden Ltd

The self-praise was new to Holden and unusual in the GM empire but can perhaps be traced to Hartnett's brash management style. Biographer, Joe Rich, called Hartnett a technocratic brigand suggesting he had: "...an immoderate hunger for attention and recognition ".⁸⁸ For Harry Irwin:

One of Hartnett's achievements was realization that Australia was different from other countries.....[and responded] to differences in operating conditions and market nuances and opportunities.⁸⁹

Irwin cites both the coupé utility and all-enclosed coupé as examples of Hartnett's opportunities. Paul Beranger (2018) recognises Hartnett as a Designer, devoting a chapter to his achievement. Social commentator, Clinton Walker suggests:

Australia was tucked away down here at the bottom of the world, almost beyond Detroit's view, both Ford and GM-H were able to get away with innovative design variations that might have been stymied by corporate politics closer to home.⁹⁰

Walker also suggests the all-enclosed coupé could be called the Monaro's grandfather: "...the sloper even showed the way internationally".

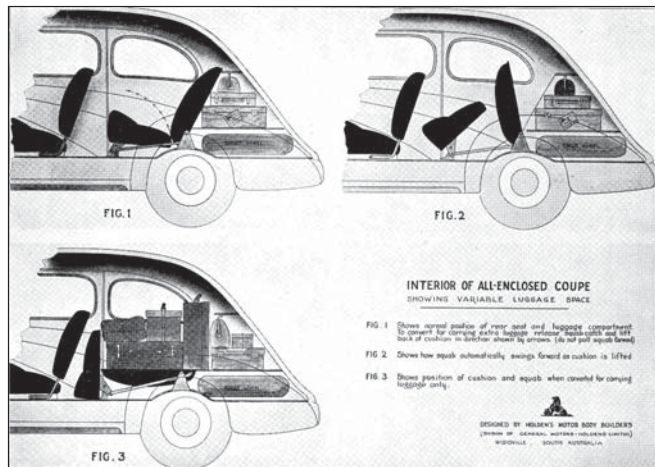
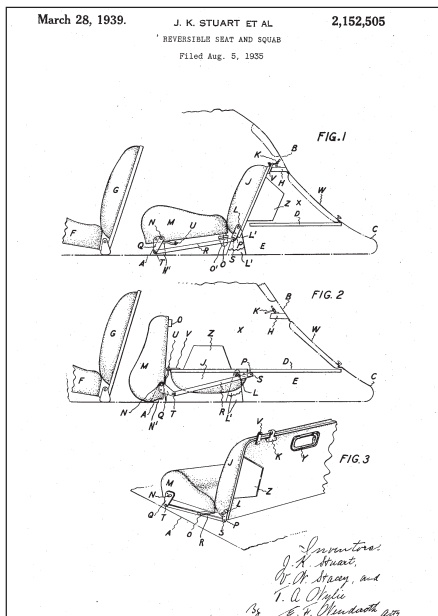


Fig. 7.42
 Left. All-Enclosed Coupé
 folding rear seat patent.
 US Patent Office

Fig. 7.41
 Above. Holden detail of the
 All-Enclosed Coupé folding
 rear seat.
 Holden Ltd

Until now the designers of the all-enclosed coupé have remained unknown. A search of the American Patent register shows a patent, lodged on 1 May 1935, in the name of Kingston Stuart (chief engineer), Thomas Wylie (draftsman) and Valentine Stacey (stylist). The body engineering was performed by Chaplin.⁹¹ (Figs. 7.41 & 7.42)

The style arose following the loss of Plymouth roadster bodies to Richards in 1935. Hartnett met with Jim Holden, King Stuart, Tom Wylie and Roy Rainsford in Adelaide to discuss the matter. The Holden coupé bodies were all produced from the roadster tooling as roadsters had the highest volume. The idea of bringing the dickie seat passengers under cover was suggested and immediately adopted, Hartnett calling it a fast run back model, Hartnett said of the style: “Nothing in GM or any other manufacturer at that time known to us had anything like this styling which later years became so popular and readily accepted”.⁹²

The styling was not revolutionary, Paul Jaray’s sketch from 1922 showed the way to streamlined rear ends and the 1933 Silver Arrow by Philip O Wright, despite being a 4-door car, displayed an intelligent masterful sweeping body.⁹³ At Cadillac, Harley Earl’s team designed a one-off demonstration car in 1933 that shows a remarkable similarity Holden body but Hartnett, in *Big Wheels and Little Wheels*, assures us that neither this car, or any other, influenced the Holden designers. While the Cadillac is claimed to have prompted Gordon Behring’s Cord design, the 1935-1936 Holden body was less influential with only the Bishop Brothers providing a drawing based on the style for coach builders in 1935.⁹⁴ (Fig. 7.43) The Airline body in Britain developed independently and was first applied to the 1934 production Riley Kestrel and had been used on the one off 1930

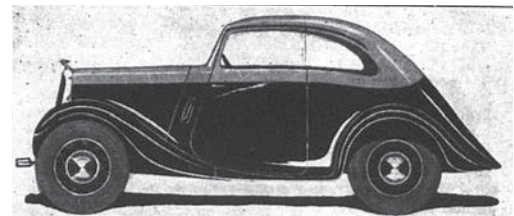
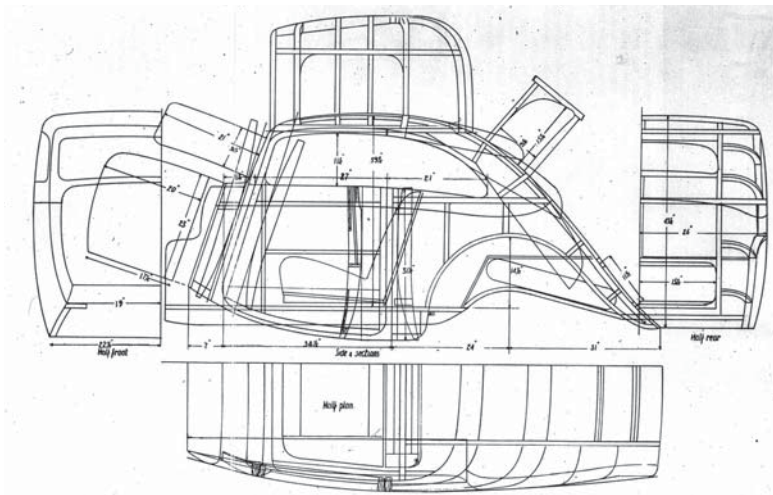


Fig. 7.43
Bishop Bros Airline Coupé based on a Morris Minor chassis.
The Coach and Motor Body Builder

Blue Train Bentley and exemplified by Thrupp and Maberly's 1933 3.5 litre Bentley. (Fig. 7.44) By 1935 the Airline style was in vogue and a number of British coachbuilders, were making them.⁹⁵

Of the Australian coach builders only Martin & King and Smith & Waddington showed any styling flair during this period. While most special-order bodies followed the prevailing trend, a few customers asked for something different. They were usually customers with a high value chassis like Rolls Royce.⁹⁶ Another feature of the bespoke coach builders was the production of an up-to-date body for old chassis. Owners purchasing a high-priced chassis that was as a matter of course well looked after, sought to re-body rather than purchase a new vehicle. Rolls Royce facilitated this as the grille appeared unchanged over a long period. Some owners were happy to incorporate the original bonnet panels as well. (Figs. 7.45 & 7.46)

The first GM-H all-enclosed coupé ran through 1935-36 and was replaced with a new all-steel version in 1937 that ran with slight revisions through 1940. The second design showed some styling flair, made possible by the all-steel construction. The door frame was thinned down and the centre pillar reduced to provide less bulky side view. Leo Pruneau, Holden's Director of Design (1975-1983) comments that the first coupé body was done by a draftsman, but the 1937 body was done by a stylist.⁹⁷ Again two body styles were built, one for 6-cylinder chassis (Fig. 7.47) and a second for 8-cylinder. (Fig. 7.48) The 6-cylinder body's rear end panel swept under the body while the 8-cylinder swept out. The 6-cylinder body was also fitted to Vauxhall 25hp chassis and a unique convertible coupé version made with a patented opening roof. (Fig. 7.49) Charlie Phillips said "the design of the convertible roof car was a guinea pig for any potential car make".⁹⁸ There was also a 1936 Hudson Terraplane produced by Ruskin motor

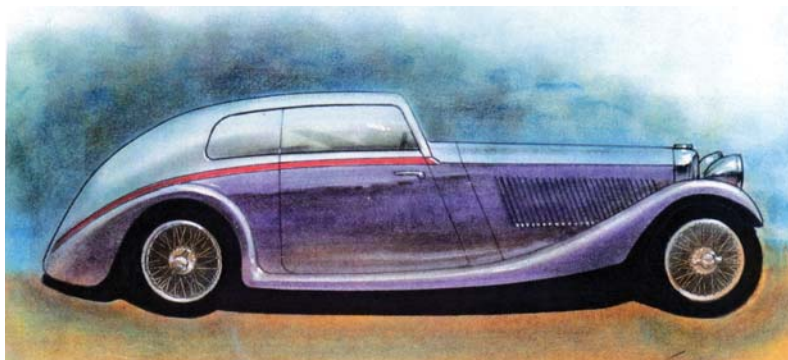


Fig. 7.44
English coachbuilders Thrupp and Maberly's 3.5 litre Bentley Airline Coupé.
Art Deco and British Car Design

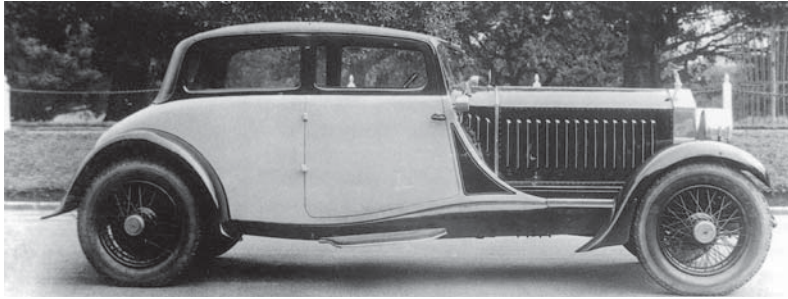


Fig. 7.45
1932 Martin & King Coupé
body on a Rolls Royce Phantom
II chassis.

**Rolls Royce and Bentley in the
Sunburnt Country**



Fig. 7.46
Smith & Waddington Coupé
body on an early 1915 Silver
Ghost chassis. Body based
on a style by London coach
builder, Lancefield.

**Rolls Royce and Bentley in the
Sunburnt Country**



Fig. 7.47
The 1937/8 all-steel Holden
All-Enclosed Coupé body on
a 1938 Chevrolet chassis,
Art Deco theme.

Holden Ltd



Fig. 7.48
The Holden 1937/38 All-
Enclosed Coupé body on a
long wheelbase 1938 Buick
8-cylinder chassis,

Holden Ltd



Fig. 7.49
Holden All-Enclosed Coupé
Convertible roof body on a
1938 Vauxhall 25 chassis with
a patented folding mechanism.

Holden Ltd

bodies that featured the Holden folding rear seat and a body very similar to the Holden. (Fig. 7.50) It is possible, but unlikely, that Holden sold sets of coupé panels and these were then assembled, a practice that commenced in 1931 and was available to small body builders.⁹⁹

The second version was produced in greater numbers but over five years. T J Richards built their own body for Dodge and Plymouth for 1937-38 and Ford Australia made a V8 Standard and DeLuxe for 1939-40. (Figs 7.51 & 7.52)

On rare occasions Holden departed from American styling, one example being the 1937 Chevrolet body. The Chevrolet design ran a swage line from



Fig. 7.50
1936 Hudson Terraplane All-Enclosed Coupé bears a strong resemblance to the Holden body.



Fig. 7.51
T J Richards All-Enclosed coupé body on a 1937 Dodge chassis.
N Darwin

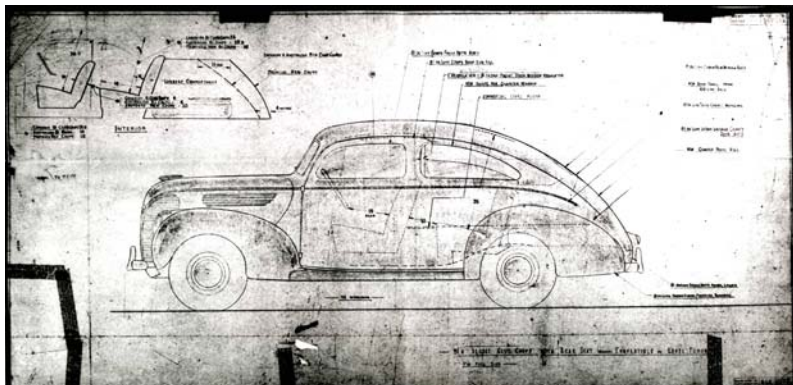


Fig. 7.52
Ford Australia drawing of 1939 Ford Coupé drawn by Lew Bandt
Bandt archive - Vict. State Library

the bottom of the bonnet side panel through the cowl side into the front door panel. Holden eliminated the swage in the door and modified the cowl side to suit. Holden also redesigned Chevrolet's bonnet side, eliminating the louvers and replacing them with a stylised design. This was the first time Holden had pressed any sheet metal forward of the firewall. (Fig. 7.53)

In 1936 the commercial body plant relocated to Fishermans Bend, Victoria, where designs for all types of commercial bodies on American and Vauxhall chassis were made. Passenger chassis were used to produce panel vans for tradesmen, bakers and the Post Master General. (Fig, 7.54)

The Holden designers had one further innovation in their tool kit. With the arrival of the large Hamilton press, not only was a turret top roof possible but also a one-piece side panel. (Fig. 7.55) For the 1937 bodies Holden decided just four major panels for each body size would suffice. This would prove to be the most economical approach. The panels were roof, floor and two sides.¹⁰⁰ The side panels were designed to encompass up to five separate parts in one pressing: these were the cowl side, centre pillar, rear quarter, roof rail and sill panel. A further advantage was the elimination of welds across the weather seals, each side normally having eight welds creating eight opportunities for a poor seal. The single pressing also



Fig. 7.53

Above left. 1937 Chevrolet two door sedan showing swage line into the front door. Also note the bonnet louvers.

Chevrolet

Fig. 7.54

Above. The Holden 1937 Chevrolet body (Panel van style) with an absence of swage line in the door and different bonnet side treatment.

Holden Ltd

Fig. 7.55

1938 Holden COP (Chevrolet Oldsmobile Pontiac) body cut away to show structure design

Holden Ltd

reduced the number of jigs required to align the body prior to welding and provided a superior alignment for each door. The one-piece side frame was first built for the small Vauxhall 10-4 body, then the Vauxhall 14 in 1937 and finally, by 1938 all Holden sedans used this method of construction.¹⁰¹ (Fig. 7.56) Holden body designers also developed a 2-stage door seal to prevent dust entry. (Fig. 7.57)

In chapter six I discussed Herbert Wylie's role as Holden's first layout draftsman and the position of both lead body designer and trainer. In late 1934 Wylie fractured a rib that led to a lung complication and his early death on 15 August 1935 at 52 years. Replacing Wylie was King Stuart who became the head of Engineering in 1934. Stuart was able to integrate the roles of engineering and production engineering thus reducing the lead time from the receipt of an overseas chassis drawing to make a completed body.¹⁰²

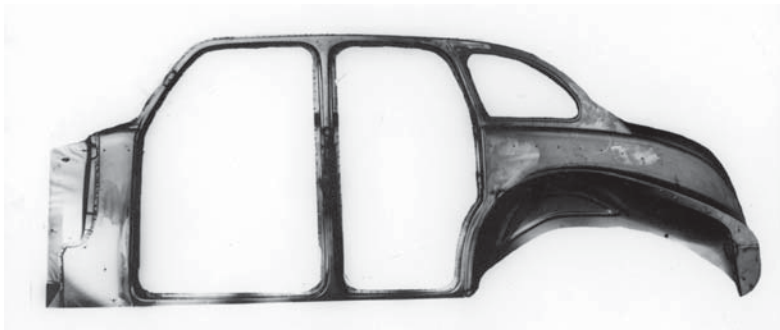


Fig. 7.56
1938 Holden COP single pressed side panel.
Holden Ltd

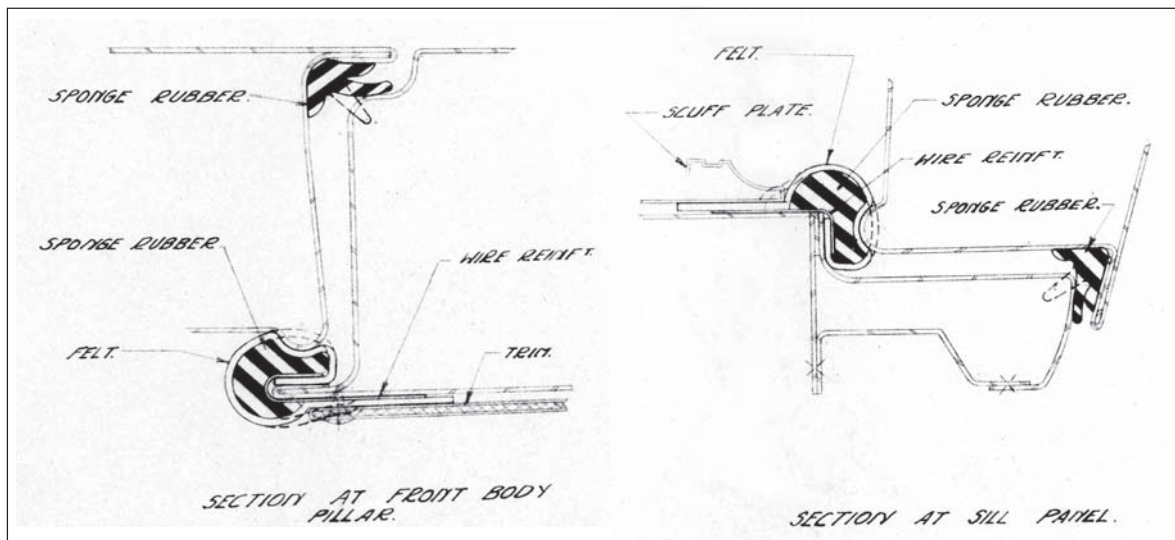


Fig. 7.57
Two views of the GM-H Engineering 1938 door to frame dust seals.
GM-H Engineering Woodville 1939 In Retrospect folder

Mechanical designers

As well as advances in Australian automotive design the post-depression era witnessed developments in mechanical design. Four talented designers, Howard Hobbs, Arthur Northey, Anthony Michell and Raymond Moore emerge at this time with creditable world class designs: .

Howard Hobbs

Howard Hobbs, son of an Adelaide fruit grower, had no formal engineering education, gaining his mechanical knowledge from magazines and books. At 14 he had constructed a working aeroplane with a motor bike engine but minus the wings and within ten years had a working fruit grading machine that was patented in 1926. Driving his father's trucks and cars Hobbs began to wonder about eliminating the need to change gears. An Austin 7 was fitted with a prototype gearless transmission and presented to Professors Chapman and Kerr at Melbourne University for testing. It was deemed practical and satisfactory, resulting in Hobbs forming the Hobbs Gearless Drive Ltd company in 1931 to hold the patent and seek licence holders. Hobbs quickly realised the transmission was not saleable in Australia and so shipped his Austin 7 and family to England in June 1931.¹⁰³

Selling an automatic transmission in the early 1930s was tough, they were unheard of and owners of higher priced vehicles usually had a driver to shift gears. Following the release of the GM Hydra-matic transmission in 1939 the automatic was popularised and with the help of an English industrialist the Hobbs Transmission Ltd company was established in 1946.¹⁰⁴ By this time Hobbs had modified his design from a planetary sun gear system with weights and a free wheel clutch to an epicycle gear system with hydraulically operated friction clutches that controlled the four forward gear ratios.

Hobbs named his transmission the Mechamatic transmission, patented in 1947. (Figs. 7.58, 7.59 & 7.60) Several manufacturers tested the unit in prototypes, including Ford but only the Birmingham Small Arms Co Ltd (BSA) took up the idea for production on their 1955 Lanchester Sprite model. The Australian People's Car Aust Ltd listed the Mechamatic as optional equipment on their proposed car in 1949. In 1959 Borgward fitted the Hobbs transmission to their Isabella model, naming it a Hansamatic.¹⁰⁵ A commercial version of the Mechamatic was fitted to urban buses and

commercial vehicles through the 1950s.¹⁰⁶ The transmission strengths lay in its simplicity; however, Hobbs could not compete with the large American companies like Borg-Warner and Hydra-matic. Ironically, Hobbs received the British Richardson Gold medal award not for his Mechamatic transmission, but for his variable kinetic drive (VKD) an advanced efficient torque converter, in 1972. The VKD continued to be developed through the 1980s until Hobb's death in early 1983.¹⁰⁷

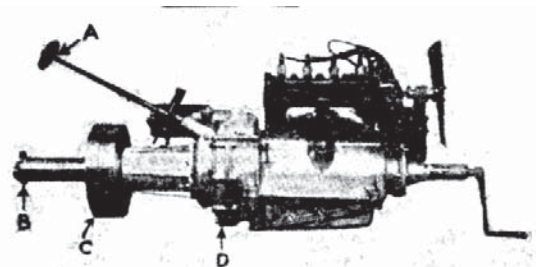
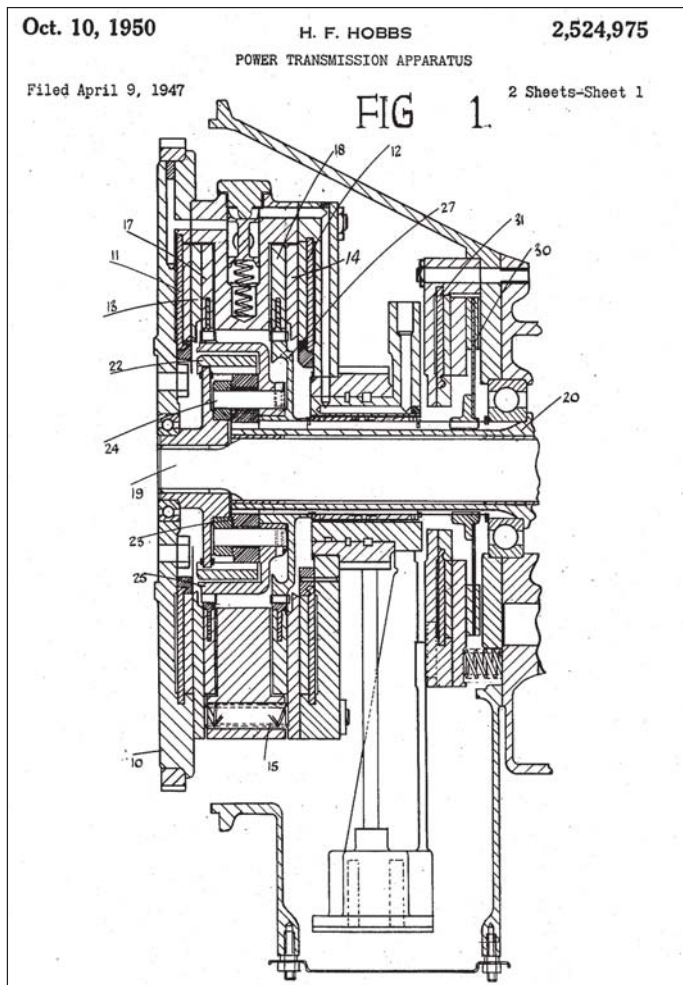


Fig. 7.58
Hobb's prototype automatic transmission fitted behind a 4-cylinder engine.

Commercial Motor, 1958

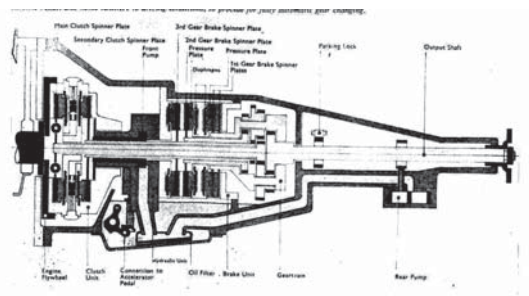


Fig. 7.59
Schematic of the Hobb's transmission.

Commercial Motor, 1958

Fig. 7.60
Left. US Patent for Hobbs automatic transmission.

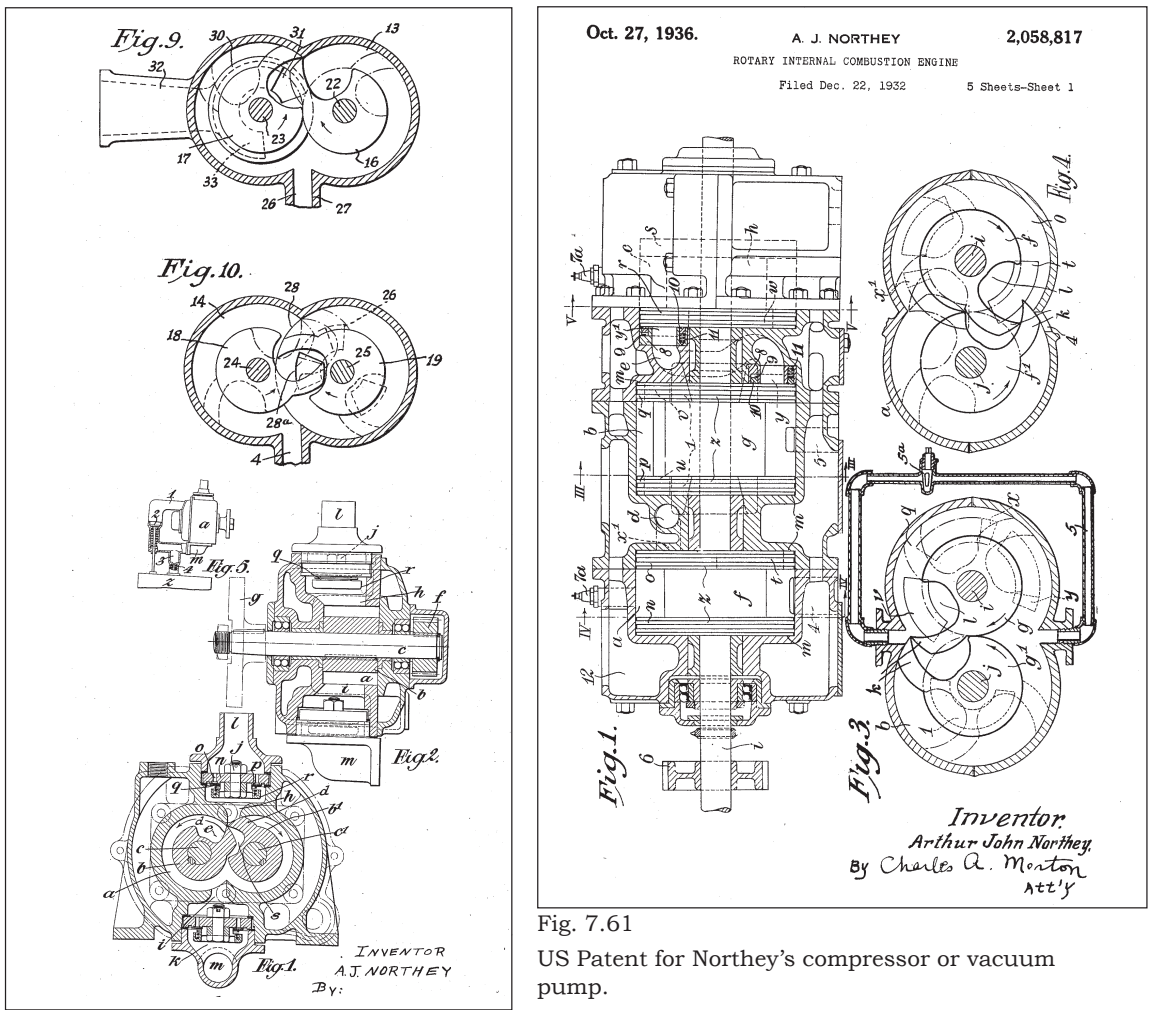
US Patent Office

Arthur Northey

Arthur Northey was born in Cornwell in 1899 and immigrated to Australia settling at Tolga in the Atherton Tablelands Qld. In the late 1920s he began experimenting with a crankless or rotary engine and he announced to the Institute of Engineers on 3 October 1928 that he had invented and patented a rotary engine. B L Sayer-Woods examined Northey's drawings and claimed the engine would develop an efficiency 25% greater than a normal internal combustion engine.¹⁰⁸

Northey established Northey Rotary Engines Ltd in Townsville Qld with the view to manufacturing his engine but the depression, made sales difficult. Undeterred, Northey returned to England in 1932 and spent the next two years on development with Leslie Boyce at the Gloucester Railway Carriage & Wagon Co. Boyce, also Australian, established The Northey-Boyce Rotary Engineering Company Ltd by July 1936.¹⁰⁹

Sales of rotary engines were hard to come by and in 1935 Northey turned his design from an engine to a compressor. To promote the engine-compressor, displays were organised at the Olympia Motor Show (London) and at the British Industries Fair; sales immediately increased and compressors were installed at many of England's dairies and factories. A further development was the Northey Ventricle pump and a motor-compressor unit that was capable of producing 30hp @ 3,500rpm (half speed).¹¹⁰ (Fig. 7.61)



The Northey engine and compressor design is known today as a Hook & Claw dry vacuum pump and compressor and continues to be manufactured by Northey Technologies Ltd, Poole, United Kingdom. The hook and claw gears were designed in Northey's original patent where two meshing gear wheels with a protruding hook and claw rotated in opposite directions in a twin cylinder case. The meshing of the hook on one gear with the claw on the other gear compressed the air or fuel mixture. Three chambers were used to provide a continuous power cycle.

Anthony Michell & Louis Sherman

An early engine designer was Anthony Michell, a civil and mining engineer who studied at University of Melbourne. He held an internationally famous patent for the Michell Thrust-Bearing (1905) that was subsequently used in auto transmissions and ship prop shafts. Michell became an expert on oil lubrication and in 1920 formed the international, Crankless Engine Company in Fitzroy Victoria.¹¹¹

In January 1917 Michell made a patent application for his crankless engine whose principle lay in a swash plate set at an angle to the shaft, so that when the shaft rotated the oblique swash plate moved pistons that shared a combustion chamber. The Michell slippers controlled an oil film

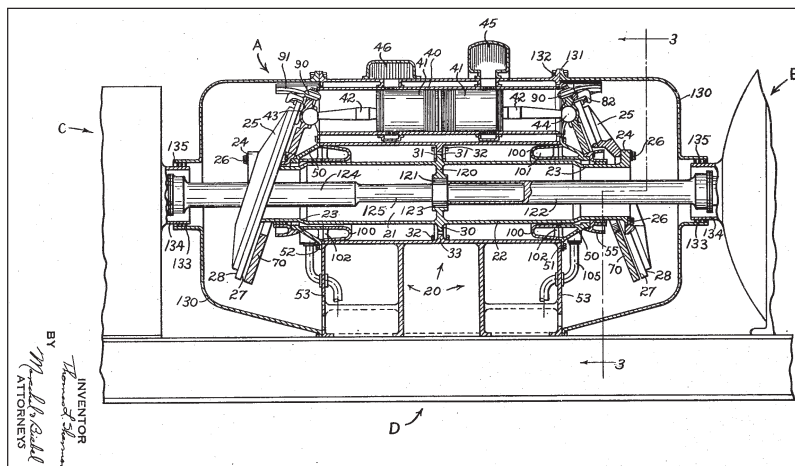
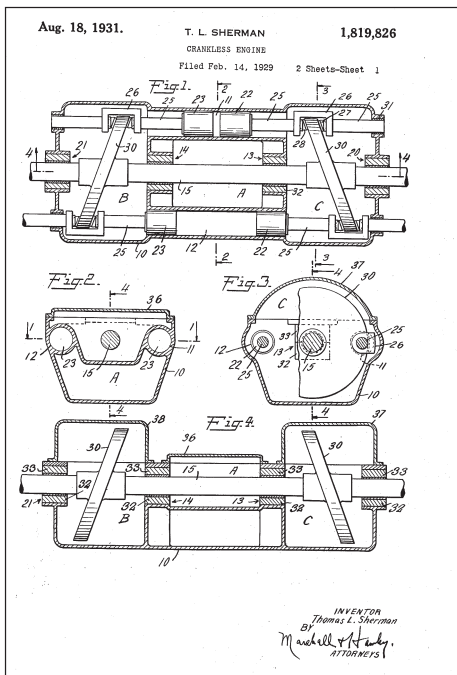


Fig. 7.62

Above. US Patent for the Michell crankless engine held by Louis Sherman.

US Patent Office



Fig. 7.63

Left. 3-cylinder rotary engine built by Phil Irving at REPCO Research and on display at the Melbourne University Engineering foyer.

N Darwin

between the cylinder wall and the swash plate, providing a seal. Michell, in establishing his crankless engine company, hired Louis Sherman, an engineering graduate from Queensland to complete the design work. Sherman, who held Patents, US 1,819,826 (1931) and US 1,997,936 (1934) on the Crankless Engine (Fig. 7.62) worked with a young Victorian engineer, Philip Irving who later said: “It was the greatest stroke of luck imaginable that I started work under two such eminent men”.¹¹²

Irving built his own engine while studying engineering at Melbourne Technical College but never developed it. He subsequently had a distinguished career designing motor cycle and car engines for Vincent, Brabham and Repco where he produced his own experimental 3-cylinder crankless engine. (Fig. 7.63)

Raymond Moore

The final mechanical designer from the 1930s, Raymond Moore was an Armadale engineer who began experimenting with a gearless transmission in 1929 and by 1934 had a working variable hydraulic transmission. A patent (nos. 19328 Australia and 2.804.016 American) was lodged and work commenced on a prototype car to develop and test the transmission.¹¹³ (Fig. 7.64) By 1940 Moore registered a small touring car of his own design, building all components, including a unique V4 2-stroke engine as a test bed for the transmission. The engine featured twin cylinders in a 90° V bolted to an alloy crankcase with 2.4-inch bore and 3.125-inch stroke. The engine was rated at 30hp and ran at 1,000rpm.¹¹⁴ The oil pump and distributor were driven from the front of the crankshaft and a vane type supercharger ran off the rear with the heavy rotating vane

acting as the flywheel. Also driving off the rear was the Raymond infinitely-variable hydrostatic transmission. A pedal operated plunger in each of two cylinders varied the distance between the casing and the vanes and thus changed the oil pressure. The pedal at maximum travel also reversed the direction of the fluid. Oil hoses connected the hydraulic motors on each rear wheel.¹¹⁵ (Fig, 7.65)

Moore displayed his prototype at the Melbourne 20th Century Mechanical Exhibition in 1950 along with his Raymond industrial variable hydrostatic pumps and engines, now made in quantity at his Raymond Hydraulic Transmission Company works in South Melbourne. By 1954 the prototype had travelled over 60,000 miles and was used daily as the works vehicle. Moore planned to manufacture of a car using his principals; however, the project lapsed as Moore found his industrial business was expanding into England and America. The Raymond transmission was fitted to industrial towing and lifting trucks, some capable of hauling 26 tons, as well as conveyor systems, crushers, powder mills and rotary furnaces.¹¹⁵ One was fitted to a Victorian railway locomotive V56 in 1960.¹¹⁷

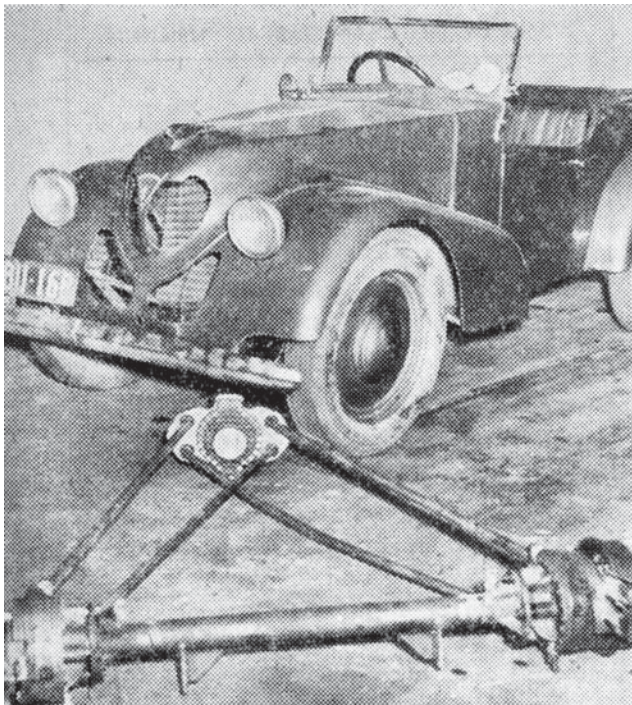


Fig. 7.65
Raymond Moore's car and patented variable rear transmission system.
Motor Manual magazine

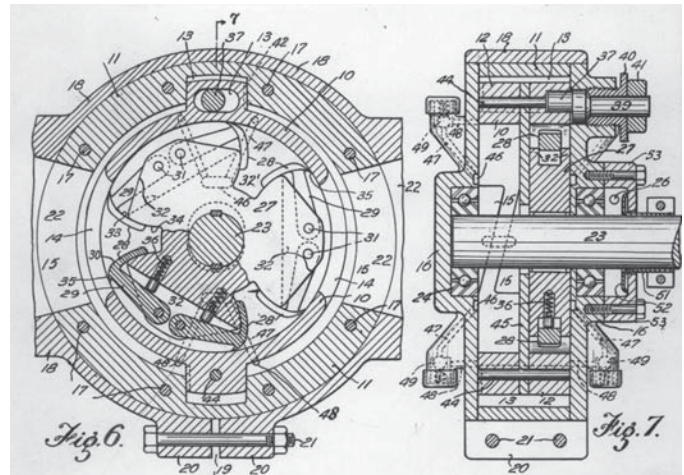
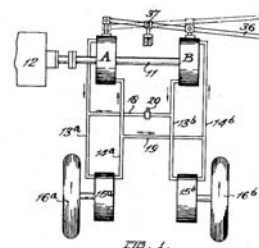


Fig. 7.64
Top. Australian patent drawing 19328.
Australian Patents Office
Below US Patent no. 2804016
US Patents Office



Summary

Australian automotive design came of age in the 1930s. Assisted by overseas trained technicians the motor body industry developed into a strong and viable sector of the economy, able to support a confident and talented young group of designers and engineers. Despite the set-back of the Depression the Australian auto companies in general and GM-H recognised the need to keep their designers, a decision that paid off during rapid growth between 1933 and 1938 when new body styles that were copied and adopted. The experience gained over this period was to play an important role in Holden's ability to build an Australian car in 1948.

The first motor body designers were layout draftsmen, the body engineer and stylist did not exist in Australia until after 1927 when Holden employed a paint and trim stylist. Holden continued to lead local body design through the 1930s developing a team of designers who would help make the company a dominant force after 1950.

Australia, despite being tagged a country without a design history, has produced several talented and capable engineers and designers who have made significant but largely unknown designs for automobile components, including engines, transmissions, suspension systems and motor bodies, whose designs have been successful in the international market.

The following chapter will examine how the Holden designers moved from building motor bodies to complete automobiles, a role they performed using world's best practice, yet a role obscured in anonymity.

Endnotes

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CHAPTER 8: Australian Design in the 48-215 Holden

This last chapter explores the continued development of Australian automobile designers, particularly those working at General Motors-Holden (GM-H) after 1939 when Holden transitioned from motor body design to complete automobile and manufacture. I will argue that the body designers made a significant contribution to the first Holden car, a contribution that has up until now never been fully recognised. This chapter will also reveal, for the first time, other Australian car designs planned to meet the Australian Government's post war policy direction for the automotive industry.

Australian industrial design writers, Tony Fry and Michael Bogle, suggest the only Australian content in the first Holden is advertising and marketing, and that the car was American designed.¹ Simon Jackson does not make a clear statement and discusses the perception the Holden was not Australian but rather British or American.² The belief that the Holden was not an Australian design was reinforced by a succession of automotive historians, who have retold the General Motors-Holden's Ltd (GM-H) press release stories on how the American engineers, led by Russell Begg, arrived in Australia on 28 December 1946 with three prototypes to continue development. GM-H wrote: "As his working team, Begg chose some notable engineers from General Motors and other manufacturing organisations".³

Early writers ignored the Holden design, for example Pedr Davis focused on the story of Lawrence Hartnett's, demise as GM-H managing director, as the significant event of the Holden release.⁴ Recently, John Wright (1998) provided details of some of the Australian engineers who went to America and worked under Begg: "They were given great autonomy when it came to defining key features of the design".⁵

Wright did not then explore what the key features were but more recently (2008) Wright published a thesis and history of the events culminating in the Australian Car.⁶ Wright together with Loffler and Darwin are the only historical authors to identify the early Holden car designers.⁷

GM-H assisted in perpetuating the myth that there was no local design content, through the company publication *The Holden Story* (c1957) under the heading US Co-operation which states: "Russell Begg came to Australia to be Chief Engineer of GM-H. With him came his team of selected American specialists".⁸

The company did make an attempt to correct the record in 1998 when the Holden car celebrated 50 years by highlighting the efforts of three Australian designers, Charlie Paterson, Fred James and Jack Rawnsley, the last of the original Australian design team.⁹ The change was fostered by GM-H's Sydney PR manager, Marc McInnes, a former engineering draftsman who had witnessed first-hand the local designers at work.¹⁰ McInnes has researched Begg extensively, documenting his automotive design history.¹¹

Over many years the source of the first Holden design has been attributed to incorrect designers, one source being the English historian Michael Sedgwick (1982) who wrote it was: "In fact a development of a compact Buick dating back to 1938 which never saw production".¹²

In 1983 the general consensus suggested it was developed by Chevrolet, *The History of Holden Since 1917* recording: "...the Chevrolet Research group under Lou Thoms had produced the experimental cars that were used as a basis for the Holden".¹³

Research by English GM historian, the late David Hayward, revealed the true nature of Lou Thoms GM Product Study group, a group under the direction of Earle MacPherson, GM's Chief Design Engineer.¹⁴ MacPherson also oversaw the small ill-fated Chevrolet Cadet project that existed at a similar time and has perhaps been confused with other Product group projects.

This chapter will argue that the design, of the Holden 48-215 came from three sources: experience gained by Holden engineers, stylists and draftsmen over 20 years of motor body building; a group of young designers who travelled to America as a team to work alongside the Americans; and the group of experienced American engineers, all under the direction of Begg. The chapter will also examine design activity outside GM-H and the commencement of a new phase in the Australian automotive industry, that of complete manufacture of a motor vehicle.

A climate for an Australian car

Discussion for an Australian car emerged in mid-1936 when the Lyons Government proposed a bounty of £30 on each imported motor engine. This led to proposals for local production in 1938.¹⁶ GM-H Managing Director, Laurence Hartnett, told the Tariff Board inquiry that while production of a complete motor car was practicable, it involved a number of difficulties, not the least which was the uncertainty in the continuation of the policy proposed.¹⁷ Officially, Hartnett did not favour the Australian manufacture of chassis and engines although privately he held the view it could and would be done.¹⁸ Hartnett also knew the manufacture of a full chassis was quickly coming to an end with the design of a unitary constructed Vauxhall body already planned for introduction in late 1937.¹⁹ The Tariff Board was not swayed by politics, that complete motor manufacture would occur, instead suggesting a step by step approach.²⁰

Undaunted, the Lyons Government proceeded to introduce a customs surcharge to fund an engine bounty in case an Australian manufacturer came to pass. A difficulty was Ford and GM's stand on taking local equity to cover the tooling and development cost as this ruled them out of being an engine manufacturer under the Government's scheme.²¹ The outcome was the *Motor Vehicle Bounty Bill* (1939) that required a minimum of 8,000 units per annum and a 66% Australian ownership.²² As it transpired the government had a manufacturer keen to proceed. W J (Gunboat) Smith, Chairman of Australian Consolidated Industries (ACI), glass manufacturers, had put a detailed proposition to Cabinet on 22 November 1939 and the engine bill, introduced to Parliament on 6 December 1939, formalised ACI's engine proposal. The deal between Smith and the government was not squeaky clean, as Tony Watson has revealed.²³

Smith had no design for his engine and his proposal assumed he could negotiate a 50/50 ownership with GM-H, where Holden would provide the technical expertise and design; this was totally unacceptable to GM and as Peter Swan points out, once provided to ACI the GM patents and techniques would become public goods and lost to the exclusive use of GM.²⁴

Australian car plan proposals

Pengana Motor Industries

Four car proposals and a local engine (from ACI) surfaced during the 1937 Tariff Board enquiry. William R White gave evidence to the Board that his Footscray engineering factory had made an engine without difficulty and all the requisite raw materials were made locally and in abundance. The 4-cylinder 22 hp engine had been designed by White and some friends, he said “It should be understood that the manufacture of this engine was not undertaken by me as an experiment, but for specific purpose of establishing a motor car factory upon a commercial scale”.²⁵

White also planned to build a chassis. It would appear that his engine was built at the pipe engineering firm of Mephan Ferguson and Co, as following the Tariff Board submission, White and Mephan Ferguson’s General Manager, Ralph M Currey registered the Pengana Motor Industries Pty Ltd at Footscray.²⁶ Two of Pengana’s directors, J T Buckingham (Buckingham & Ward) and W L Lee, had been involved with the failed Buckingham car of 1933. In late 1939 Currey and White went to Canberra to update the Minister of Customs on their proposed Australian car. Unfortunately, the war intervened and work was suspended until Pengana responded to the Government car plan of October 1944. By August 1945 the firm advised that the engine had been bench tested and a chassis built at the Mephan Ferguson works. The company had also commenced negotiation of the liquidated Hupmobile engine and chassis manufacturing plant from USA. It hoped to build 40 cars per week at a price of £200.²⁷ Nothing further was heard of White or Pengana and no images or drawings have been found of the Pengana proposal.

Alan Chamberlain

The second car was designed by Alan (Bob) Chamberlain, son of Herbert Chamberlain, founder of the Australian Ball Bearing Company and nephew of Harry Hawker, designer and aviator. Chamberlain senior pioneered the Australian parts manufacturing industry, taking patents on ball bearing manufacture (no. 17278) and other processes. The Chamberlains designed and made disposable oil filters, (State, Allen & MPL brands) and from 1931 began producing pistons, incorporating the Rollo Piston Company in 1937 at Fishermans Bend.²⁸

In 1935 Chamberlain visited Europe and, impressed with Dr Porsche's design of the Auto Union racing cars, returned home to crystallise an idea he had for an 8-cylinder car. In 1930 he had envisaged the idea of a light 8-cylinder sporting car with an automatic transmission. While the transmission was abandoned, the idea evolved into a chassis with full independent suspension, all-welded tube space frame chassis and a 4-cylinder 2.4 litre transverse rear engine (later replaced with a side valve Ford V8). As a result of the development of a rough sketch by Chamberlain, an artist's impression was drawn by a Ruskin Body Company designer.²⁹ (Figs. 8.1 & 8.2) The prototype chassis, with Ford V8, was on the road by October 1938 but little further work was done as war intervened and Chamberlain turned his thoughts to tanks. This V8 was not Chamberlain's first automobile, in 1929 he and Eric Price successfully raced a hand-built car, one that exists today.³⁰ (see Appendix II for Chamberlain's biography and analysis of his proposed car design)

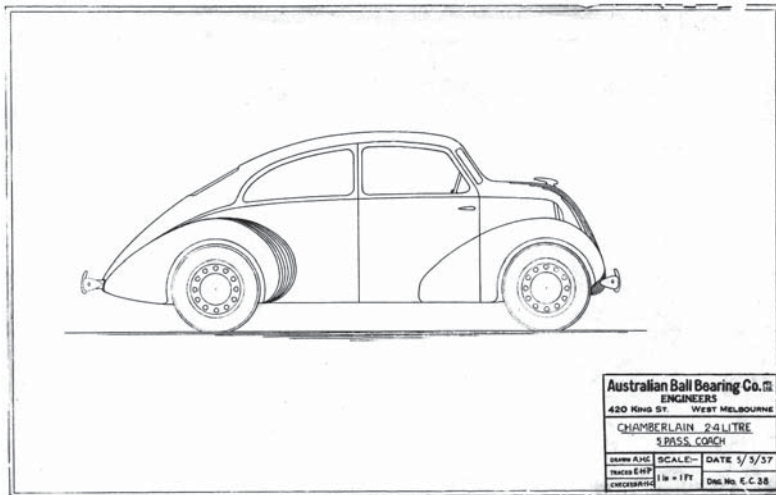


Fig. 8.1
Chamberlain car drawing by
Bob Chamberlain.

**Chamberlain - Australian
Innovator**

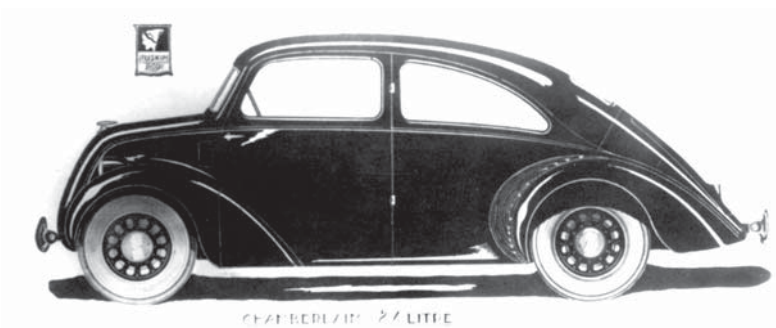


Fig. 8.2
Chamberlain car - Ruskin
drawing.

**Chamberlain - Australian
Innovator**

Australian car syndicate

A third car proposal came in 1938 from the Australian Car Syndicate when George Bateup and five others proposed a vehicle that would attract the government bounty funding. The Australian Car Syndicate contracted J A Lawton and Sons Ltd to build a 15hp 4-cylinder sample car at a cost of £1,400. The car was a 5-passenger tourer on a 104-inch wheelbase and 4-foot 8-inch track. (Figs. 8.3 & 8.4) The differential and gearbox casting were made of cast steel and a three-point suspension was fixed to a front sub-frame that was designed to fold inwards on impact. Bateup was an Adelaide motor dealer and claimed he had carried out the design personally. He invited the Premier of South Australia to start the engine on 23 March 1938 and at the end of the year put the car on display at the Royal Adelaide Show. Unfortunately for Bateup the government did not take his project seriously, suggesting it would not attract bounty funding. Bateup countered with the statement: "It might well be disclosed now that we have had representations on behalf of a big English firm ... This firm may amalgamate with us".³¹

The Lea-Francis Engineering Company purchased a shareholding in Bateup's syndicate without commitment to contribute to engineering. In

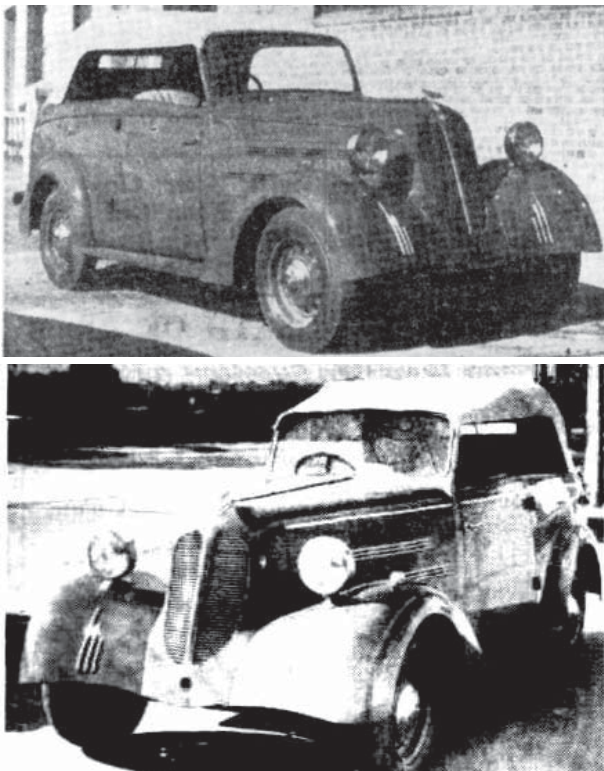


Fig. 8.3

Above. Advertising leaflet for Australian Car Syndicate.

I Hoffmann

Fig. 8.4

Left. Australian Car Syndicate 15hp 1938 car.
The Advertiser (Adelaide) 7 July 1939, 11

September 1939 Bateup announced his car would proceed in two forms, 7 and 15hp and he expected to get 45mpg fuel economy. There was no mention of amalgamation or agreement with any other motor company.

The Australian government's desire to foster car manufacture led to a number of small companies commenced design of small light cars using European makes as a basis. These included Wiles Manufacturing (DKW Germany), Die Casters Ltd (Adler Germany) and The Australian Car Syndicate (Jawa Czechoslovakia).

The Australian Car Syndicate's effort commenced started as a backyard effort, a touring body on an old American car chassis and a poorly conceived prototype engine based on a JAWA engine, that was in turn based on the German DKW. Bateup approached machinist Harold Clisby to build his engine, a 4-cylinder 15hp unit. A pattern maker produced castings and Clisby produced a finished engine struggling as Bateup made changes: "It was never designed, it all happened,.... Oh boy what a nightmare it was...it was hit and miss".³²

Bateup's proposed to use an ex-government munitions factory for assembly. There was some merit in this idea even if the government liaison officer, J D Wainwright, was not impressed with Bateup's bluster, writing:

Mr Bateup's car is another of those cases where an enthusiastic man or syndicate has made a car and that is all there is to it. There are several similar ventures around Australia with nothing to back them up, and I feel we should not encourage them at all but simple say it is their baby.³³

Bateup disclosed the true origins of his design in a letter to Hon Robert Menzies on 25 July 1939, advising the design came from a Czechoslovakian company and was similar to the DKW car and that Bateup had signed manufacturing rights and ordered a sample car (the basis was probably a Jawa model 700). It is possible that Bateup planned two vehicles, a 15hp locally produced model and an imported 7/8hp.³⁴

Die Casters

Roy Newton of Die Casters Pty Ltd, a company formed in 1926 at Richmond, Victoria, had provided high quality castings to Holden and Ford for many years. Die Casters began to plan a people's car around 1935, but for some reason they never officially registered their development of a car with the government, although the department responsible was aware of their plans.

Newton was impressed with the German Adler Trumpf 10hp chassis with a 995cc 4-cylinder 4-stroke engine. In 1939 six Adler chassis were imported and fitted with five different body styles then tested extensively.³⁵ (Figs. 8.5 & 8.6) The outbreak of war stopped development until mid-1945 when the company learnt of 22 impounded Adler chassis. Adler had been on sale in Australia since 1934 and at the outbreak of war the unsold Adler stock held by the Canada Cycle and Motor Company was seized. Die Casters asked the Government for 10 of the chassis for testing. A briefing note for the Minister of Transport suggests the Die Caster's plan had merit, the Adler design was patent free in Australia and the Adler design would save up to five years' development.³⁶



Fig. 8.5

Die Casters prototype car,
based on an Adler chassis.

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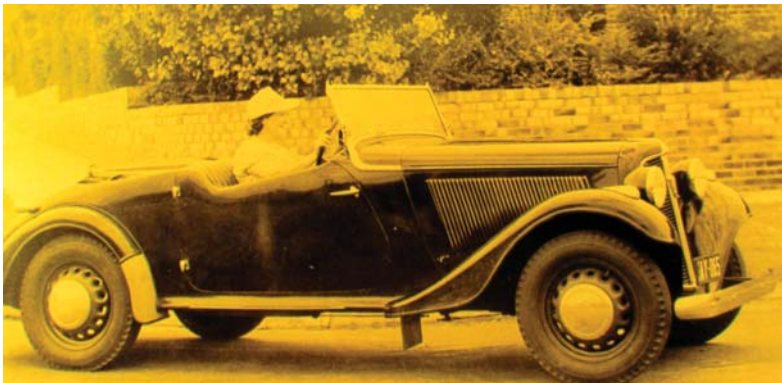


Fig. 8.6

Die Casters prototype roadster,
based on an Adler chassis.

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Die Casters cited two design parameters, roadworthiness and rugged strength. A production run of 20,000 units was deemed sufficiently profitable with Die Casters producing the chassis from purchased and manufactured parts and bodies purchased from local body builders.³⁷ It would appear Die Casters decided to abandon plans after learning of GM-H's Australian car in June 1946. Die Casters were one of seven firms to respond to Government car manufacturing plan submitting plans for an Australian car after WWII.³⁸

Thomson Wiles project

Neither Jack Thomson or the Wiles company officially responded to the Tarriff Board call for expressions interest in an Australian car but their effort is worthy of record.

Early in 1947 Ken Wiles announced his company would manufacture a small light car with single-unit construction designed by former army captain, Jack Thomson. The Wiles brothers, Ken, Richard and Ivor, headed a manufacturing company which gained international recognition for an Army camp cooker. The car was to be fitted with a 2-stroke 2-cylinder engine designed by Thomson and built by Harold Clisby and was expected to sell for £300.³⁹ A prototype, the second built by Thomson that went on show at the Adelaide Exhibition in April 1947, showed similarities to a 1939 DKW and later Wiles admitted the transmission and axles were DKW. The vehicle was re-bodied at the Wiles Manufacturing Company Mile End works under the direction of English auto engineer, E Davis. The design employed many of the DKW features as they had not been patented in Australia. Wiles employed former DKW engineer, Kurt Hansen and South Australian engineer, Paul Bohlen, to assist in the car's development. Wiles said the car, a 5-seater tourer on a 103-inch wheelbase, would be made locally except for some electricals.⁴⁰ (Fig. 8.7)

Wiles took on Thomson's body design, dropping the risky elements, the water operated brakes and unconventional front suspension. Since 1938 Thomson's engine had been updated using ideas gleaned from a DKW 2-stroke 2-cylinder engine.

The Adelaide firm, J A Lawton and Son, through Continental Motors, DKW agents, provided Wiles a complete DKW car, knowing DKW did not take out Australian patents. Following the April showing Wiles built a

second prototype (third Thomson car) and exhibited it at the September 1947 Royal Adelaide Show.⁴¹ This attractively styled 2-seater, featured only imported Lucas electricals and imported Timken bearings and a novel feature was concealed headlamps (behind the radiator grille). (Fig. 8.8) Described as a 7.2hp light car (17cwt) capable of 45-60mph and 45-50mpg, it was driven to Canberra, and Sydney but suffered severe engine wear on the journey home. Whether it was through setback or foundry costs, the Wiles brothers began to lose enthusiasm for the car design after this event. Ivor Wiles, in an unpublished biography, points to a foundry costing £250,000 as being a major hurdle. Prototype engine castings had been outsourced and were of poor standard.⁴²

In 1949 a third prototype, that closely followed DKW design and now seated four passengers, was built. (Fig. 8.9) At this point the Wiles brothers withdrew, leaving Thomson to seek other backers and form Small Cars Ltd. (see Appendix I)

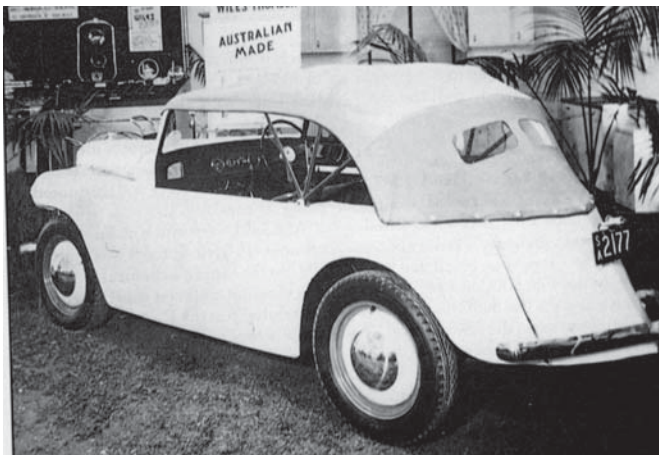
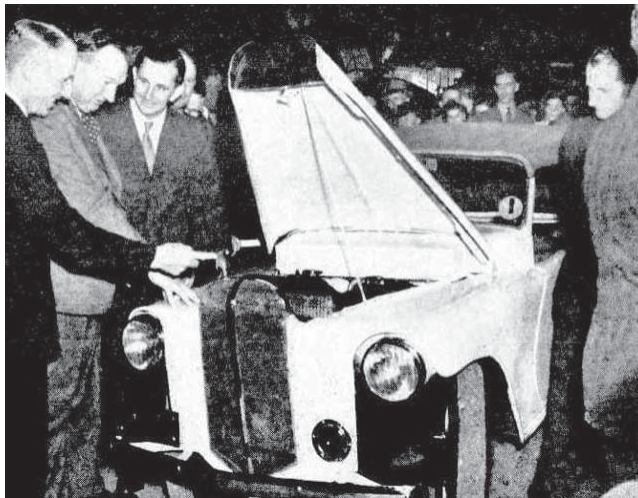


Fig. 8.7

Left. Announcement of the Wiles car at the Adelaide Motor Show. The prototype was based on a pre-war DKW.

The Register (Adelaide)

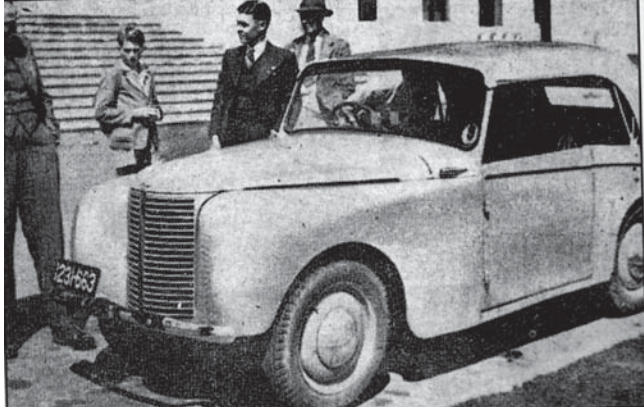


Fig. 8.8
The Wiles 2nd prototype with concealed headlamps.

I Hoffmann

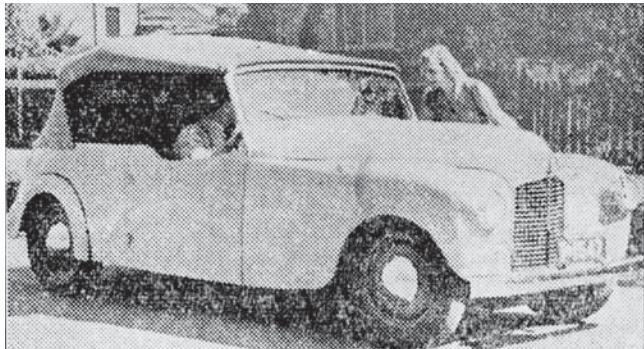


Fig. 8.9
The Wiles 3rd and last prototype built in 1949.

Australian Motor Manual

War intervenes

The declaration of war indirectly contributed to the success of the Australian post-war car. The facilities required for munitions production, much of it related to automobiles, meant automobile engineers and designers became directly involved in producing the tools of war. GM-H, for example, manufactured guns, aircraft, engines and over 200 different military motor body types. *The War Record* details much of this effort.⁴³ Likewise, Ford Australia turned their facilities to munitions and their effort is extolled in *The History of Ford in Australia*.⁴⁴ Both Ford and GM-H became involved in armoured vehicles, armoured cars, machine gun carriers and scout cars. The early work on these vehicles is covered in *Australian Military Equipment Profiles (Vol 2 & Vol 3)*.⁴⁵ Ford began developing a gun tractor based on an English Ford chassis in 1936 and from 1933 supplied components for an Australian designed armoured car, Local Pattern (LP-1) named Corroboree. LP-2, on a Chevrolet truck chassis named Boomerang followed in 1937. (Figs. 8.10 & 8.11) Both were made at the Victorian Maribyrnong Ordnance Factory under the direction

of Major Wilton and Captain Ramage.⁴⁶ LP-1 was initially designed in the Ford Geelong engineering office under Lew Bandt using detailed drawings of the Rolls Royce 1920s armoured cars as a starting point.⁴⁷ From 1939 LP-3 and LP-4 armoured cars followed using a shortened Ford 91T 3-ton chassis, 4x2 on a LP-3 and 4x4 Ford Marmon Herrington all-wheel drive axle system on the LP-4. They were built in the Maribyrnong factory (LP-3) and Islington Railways workshops in South Australia (LP-4).⁴⁸

Despite the accolades by the *Sydney Morning Herald*, these armoured cars were not successful and were only ever used for training.⁴⁹ In 1942 Rupert Vincent Kirsch, a Carlton hat manufacturer and V M Wright, an accountant, designed and built an armoured car with a proposal that the public donate car chassis for the armoured body. Using only mild steel plate and standard tyres it was considered unsuitable and failed to gain the approval of General Blamey.⁵⁰ (Fig. 8.12)

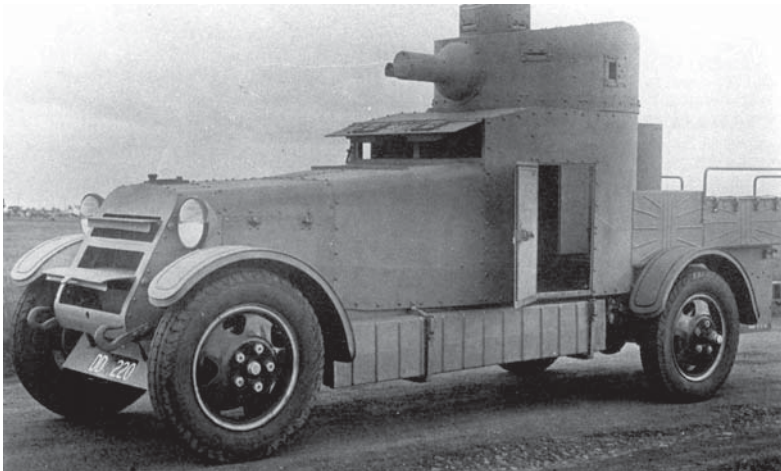


Fig. 8.10
Corrobboree LP-1 Armoured
Car.
MK Cecil - Military Profiles

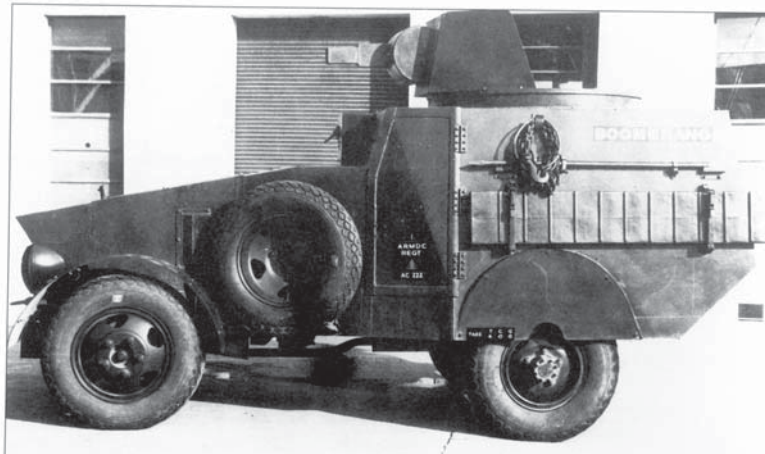


Fig. 8.11
Boomerang LP-2 Armoured
Car. **MK Cecil - Military
Profiles**

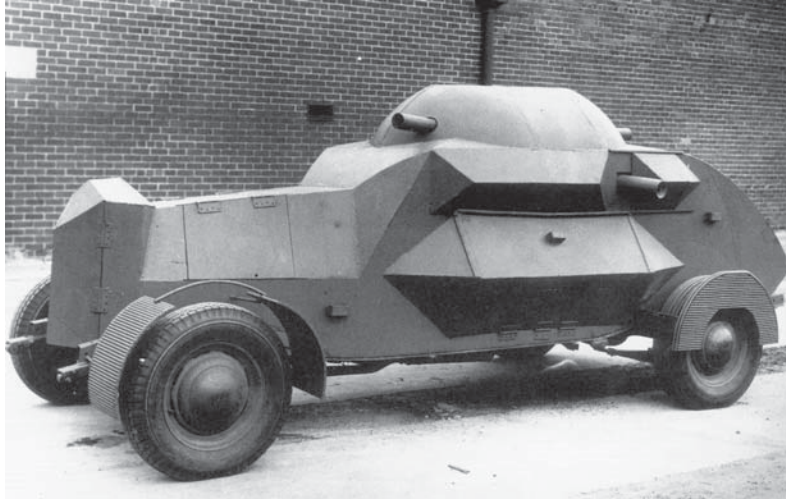


Fig. 8.12
Above. Rupert Kirsch
Armoured Car.
MK Cecil - Military Profiles



Fig. 8.13
Left. Dingo Scout Car under
assembly at the Ford Works -
Geelong.
MK Cecil - Military Profiles



Fig. 8.14
Rhino Armoured Car.
MK Cecil - Military Profiles

The Dingo scout car was another Australian design developed using a Ford V8 engine and produced at Ford's Geelong Plant with armoured hulls made in the Victorian Railway workshops. Some 245 were built before a redesign was requested, but the project was cancelled before the redesign was incorporated.⁵¹ For the second attempt at a scout car, the Rover, a long wheelbase vehicle using Ford running gear and chassis, was assembled at the Ford Geelong works and then sent to Ruskin Body Builders where the welded hull was fitted. Later the Victorian Railway workshops produced hulls and were also involved in assembly. A total of 40 Mk1s and 201 Mk2s were produced.⁵² (Fig. 8.13)

One further Australian armoured car was attempted by the army. A pilot Rhino heavy armoured car was built in January 1943 by GM-H at Fishermans Bend with the railway workshops assisting. (Fig. 8.14) The Rhino used a Chevrolet Canadian Military Pattern (CMP) Model 8446 4X4 chassis with a rear engine that had been developed by GM Canada for the Canadian Fox armoured car project. The detailed design work was carried out by the Woodville Engineering Office. The project was plagued with problems including conflicting army specifications to simple communication breakdowns and finally, a broken gear box during testing ended the Rhino's production before it commenced.⁵³

All attempts to build a practical Australian light armoured vehicle failed for various reasons; an enduring theme was the army's continued push to build heavy armoured plated bodies on chassis designed for civilian purposes. While it is unknown who the army designers were, it appears likely they were overseen by career soldiers not engineers. After 1943 Australia became less reliant on light armoured vehicles as attention turned to jungle warfare; those vehicles that did fill armoured car requirements were all imported. One vehicle destined for use by the US Army was the Ford S1 scout car assembled by Ford at Geelong with a locally manufactured (railway workshops) hull.

A more successful vehicle project was the Machine Gun Carrier. In early 1941 *The British Supply Mission* expressed a view Australia could not build the carrier in any sufficient quantity. Not only were over 5,000 produced but they came off the assembly line three months ahead of schedule with the claim they were superior to the British version on which they were based. The 1938 English version was based on the Carden-Loyd Tankett's design from the 1920s. This unit bears a strong resemblance

to Lancelot de Mole's 1913 tank design, including de Moles warping (or track displacement) track idea that provided steering.⁵⁴ The Victorian Railway workshops became the major contractor and carriers were initially built at their Newport railway workshops from 1940. After August 1940 Ford's Homebush plant in New South Wales, the Metropolitan Gas Company (MGC) workshops (Fitzroy), Islington railway workshops in South Australia and State engineering workshops in Western Australia joined the manufacturing operation.⁵⁵

The first version Local Pattern (LP-1) was very similar to the British design using a riveted hull. (Fig. 8.15) The second version, LP-2, utilised locally sourced ABP3 armour steel, welded rather than riveted steel providing a stronger hull. The tracks now had track displacement steering rather than the local PBR brakes that failed under severe conditions.⁵⁶ (Fig. 8.16) Ford engineers designed drives comprising 1938/1939 Ford commercial axles, then 1940 Ford truck axles. In 1942 the MGC commenced manufacturing an extended version of the LP-2, strengthening the hull to accommodate a 2-pounder gun and 112 rounds of ammunition. The Ford V8 engine and transmission was relocated to the front left of the vehicle; a further modification to this carrier was the fitment of a 3-inch mortar that had a

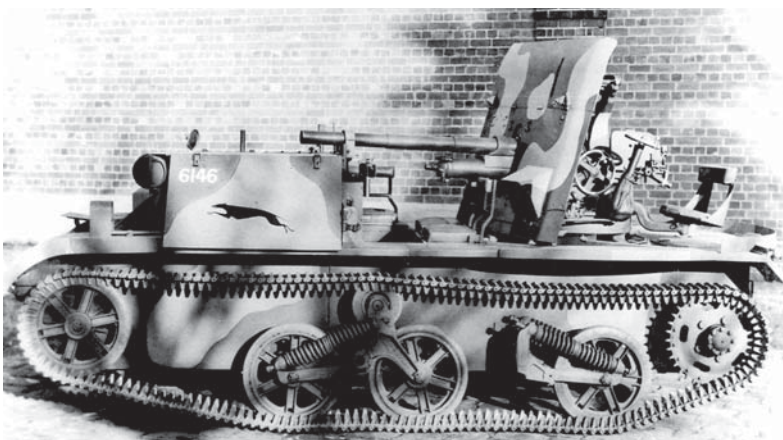
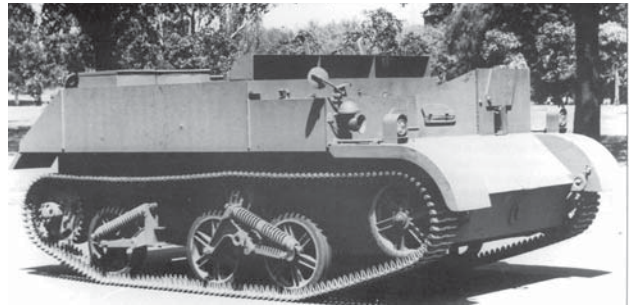
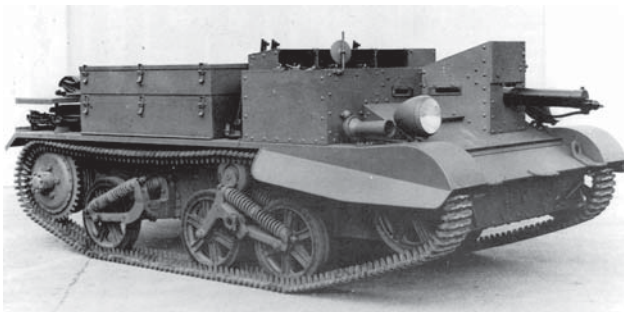


Fig. 8.15
Above left. Machine Gun Carrier LP No 1. with English design riveted hull.

Fig. 8.16
Above. The Australian designed welded hull MG Carrier LP No 2.

Fig. 8.17
Left. Carrier modified to take a 2-pounder Anti tank gun.

MK Cecil - Military Profiles

360° traverse. The 2-pounder gun and 3-inch mortar were two different designs, both based on the same basic hull. Two hundred anti-tank 2-pounder carriers and 400 3-inch mortar carriers were made. (Fig. 8.17) The designers of these modified carriers were likely based in the MGC drawing office as correspondence exists between them and The Directorate of Armoured Fighting Vehicles (DAFV).⁵⁷

The DAFV design office evolved from a small army design section in 1939 that operated under the Ministry of Munitions. The designers were initially army personnel with civilians from various government departments being loaned as design work increased. Designing munitions lagged demand this was highlighted at the end of the war during a review of the design division's activities noted: "It cannot be refuted that at the beginning of the war troops could be raised and at least partially trained before the complete equipment could be made available".⁵⁸ In addition to the design office the army established four experimental and testing facilities, to proof guns, ammunition and fighting vehicles.⁵⁹

Armoured vehicles provided a serious problem for designers, specifically the supply of armour plate, or rather the lack of it. At first armour plate was imported from Hadfields in Sheffield UK, though when demand in the UK forced Australia to look locally, BHP answered the challenge. BHP metallurgists developed armour plate made from nickel-alloy steel. As Australia's total nickel production was being used in gun barrels, BHP and Commonwealth Steel subsequently developed ferro-zirconium alloy steel to make armour plate. The plate was cheaper to produce and superior, being used on the Dingo scout car, Australian carriers, 25-pounder gun shields and Cruiser tanks.⁶⁰

Hartnett lamented the Australian Government's unpreparedness for munitions production in 1939 and as Director of Ordnance Production under the Director General of Munitions, Essington Lewis, he had the job of making the guns, ammunition and 101 other items the army, air force and navy would require. At the time Australia's only serious field gun was an 18-pounder produced in 1914-1918. There were no drawings or suitable munitions factory that was geared to build the quantities that were required. So field gun production was undertaken by several engineering firms, the 25-pounder field gun barrel was forged by Australian Iron & Steel, machined by CSR & Clyde Engineering and assembled at the GM-H Pagewood plant using components from Richie Bros, Tramway workshops, Australian General Electric and ACI.⁶¹

Little is known of the Australian munitions design and engineering. John Storey, Chairman of the Joint War Production Committee, provided some insight in 1954 into the Australian automotive industry's role in tooling for and production of aircraft, engines, mines and guns, without mentioning the engineering and design work.⁶²

An entirely different project was the Beaufort Bomber (and later Beaufighter) conceived for Australian production in 1939. Based on an English design, the Bristol Beaufort was designed to carry torpedoes and became one of Australia's front-line aircraft and the first Australian all-metal aircraft built. Production of the plane would see many modifications to the Bristol design to suit both durability and the inability to source components in England. A Beaufort Division under the Aircraft Production Commission had been established in 1939 with Storey as director.⁶³ Storey had been GM-H's production manager and he soon turned to his former employer for engineers when it became apparent the Bristol design was in some areas technically flawed and its "plans, drawings and manufacturing data were grossly inaccurate. The Bristol Aeroplane Company (BAC) was not taking the Australian operation seriously".⁶⁴

When BAC advised they could not supply the complete undercarriage Storey turned to George Niblett at National Motor Springs in Sydney. The bombing of the BAC factory in late 1940 ended any proposal to ship components to Australia. Niblett was a hands-on practical untrained engineer, relying on his production manager Reg Wood, who in turn asked engineer, Arthur Bishop, to redesign the undercarriage. Arthur Bishop was the grandson of Joseph E Bishop and nephew of the Bishops running the *Coach and Motor Body Builder* journal. His father, John Bishop, joined the *Painter & Decorator* as a journalist and his uncle Joe owned West's Wheel Works, a place of great interest to the enquiring mind of a young lad.⁶⁵ According to Robert Renew, Bishop was a modern-day Leonardo da Vinci and "the most prolific and successful inventor of mechanical things that Australia has produced. And he should be much better known than he is now".⁶⁶

The Department of Aircraft Production (DAP) utilised two major co-ordinating contractors, the Government Aircraft Factory and Commonwealth Aircraft Corporation, producing 700 Beaufort Bombers and 365 Beaufighters between August 1941 and August 1944. Forty-six of the Beaufighters were modified to MK1X standard as transport planes.

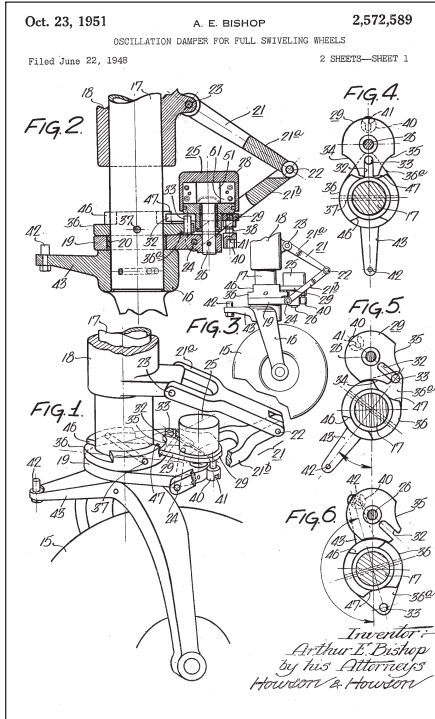
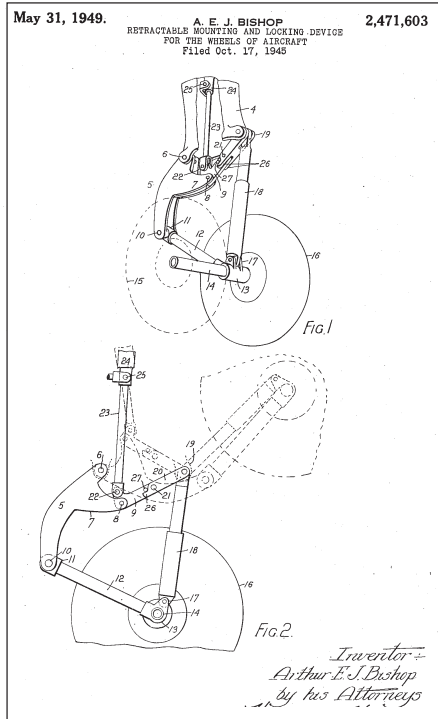


Fig. 8.18
Bishop Patents
for landing gear
damper.
US Patents Office

The original engine, a British Laurus, was abandoned for the American designed Wasp, produced by CAC at Fishermans Bend. Propellers had to be made and initially tail wheels and undercarriages collapsed until Bishop redesigned them. The tail wheel also shimmyed, sometimes badly enough to prise the torpedo loose. Bishop worked on the problem and designed a shimmy damper that he patented in July 1943 as *Means for damping swivelling oscillations in caster wheels* followed by a further 80 plus patents over 50 years, his most important being those associated with a design on variable ratio steering systems from May 1954 for automobiles.⁶⁷ (Fig. 8.18 Both Ford and Holden adopted the Bishop variable ratio power steering on their Holden HQ (1972) and Fairlane (1973) models. Bishop's design on aircraft landing gear and tail wheels was adopted readily in America on several aircraft but Bishop found the British reluctant to admit his design was superior to theirs.

The Lancaster also suffered from shimmy and Bishop was sent to Britain to provide his remedy, encountering a wall of challengers put in place by the English, his biographer records:

He faced men who were wrenchingly arrogant, blinkered and self-satisfied. Bishop commented, 'what makes it difficult here is that you just never find young chaps here in good positions.' The adoption of these Australian innovations was more

than technological achievement and a tribute to Australian ingenuity; it is also a story that swells with human frailty, frustration and nerve.⁶⁸

In the end Bishop's solution was the only viable option and the British had to purchase the Bishop design from Australia. The design was taken up in America in 1947 and this was to result in Bishop developing hydraulic power steering for plane nose wheels and then automobiles.

In addition to the Beaufort bomber the automobile designers took on aspects of other aircraft design. Ford body engineer, Bandt, for example, designed a long range belly fuel tank for Spitfires and in 1943 designed and oversaw the production of 100 P47 Thunderbolt auxiliary fuel tanks, all without drawings or tooling. The tanks were developed directly onto a P47 that had landed on an airstrip at the rear of the Geelong Ford plant.⁶⁹ Auxiliary tanks were also designed and built by GM-H for all Australian built aircraft during the war. GM-H body designers also redesigned the Beaufighter undercarriage doors to eliminate a number of small pressings and most of the riveting, achieving this by applying automotive pressing techniques.⁷⁰ (Fig. 8.19)

A project of significance for both Australia and GM-H was the development and production of an Australian version of the Gray Marine Diesel unit under the direction of GM-H Chief Engineer, Norm Pointer. An initial order for 500 165hp GM diesel engines was received in July 1943. While several Holden engineers went to the US to gather data and drawings, an engine was acquired from the American Navy, torn down and reverse engineered. Small parts manufacturers arrived at Holden to inspect and allocated those parts they could easily make. GM-H took on the balance of components. The large castings, block and head, were beyond existing foundries with the head having 19 individual cores and the block having 31. The only solution was for Holden to erect a new foundry with an electric furnace. The final hurdle was making the injectors, which required the Holden designers to first make a jig and the .0062-inch diameter twist drills to drill seven tiny holes in each injector.⁷¹ (Fig. 8.20) The Gray marine diesel engine was a significant step towards full automobile manufacture as it provided both engine design skill and manufacturing tooling and production experience. (Fig. 8.21)

A request to supply engines for the De Havilland Gipsy Moth came to Hartnett in October 1939. Airframes were being produced at De Havilland's Australian plant in Melbourne (Larkin Aircraft Supply Company), where imported engines were unavailable. In Australia metric drawings obtained from De Havilland in Canada and GM-H converted them to imperial. Two engines were disassembled to aid reverse engineering of components; GM-H, with the component industry assisting, produced 1300 Moth engines.⁷²

The Australian Cruiser Tank project (AC-1 and AC-2) went ahead with Major A Milner, head of the army design office, providing Hartnett with a design for 12-ton tank on the 12 July 1940 following a short design period. Three months later a second 18-ton tank design came from Col. R Smith and was based on two Ford Lincoln engines. Both designs were concepts, no drawings existed. Bruce Lindsay, Chamberlain's biographer, notes: "... there was almost nobody with the (army) General Staff with first-hand knowledge of tank design".⁷³

Hartnett partly addressed this gap by appointing Chamberlain to Ordnance Production Directorate (OPD) as an executive responsible for special technical development. Chamberlain immediately left for America to

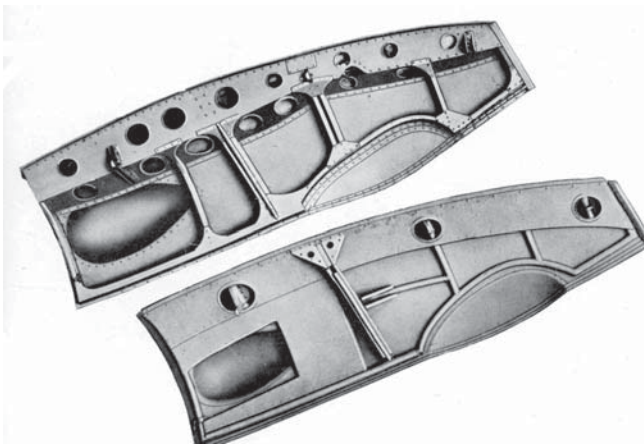
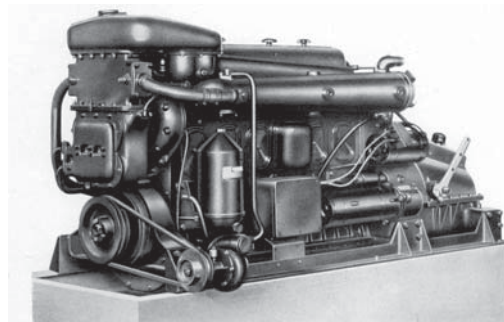
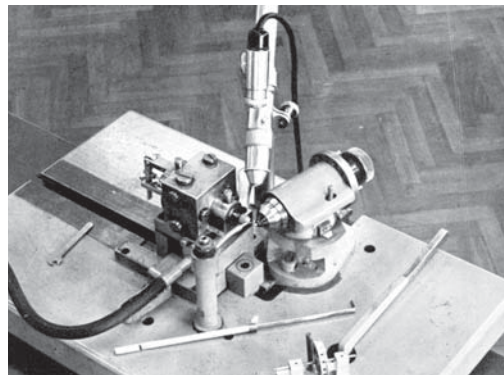


Fig. 8.19
Beaufighter undercarriage door. Top image is the English original design and lower GM-H.

GM-H War Record

Figs. 8.20& 8.21
Right above. Gray marine diesel engine injector drilling rig.
Right. Gray marine diesel engine.

GM-H War Record



investigate tank design. The tale of the Cruiser Tank's development is beyond this thesis. Chamberlain toiled on tank design yet it all came to nothing. GM-H did design and supply Cruiser tank power-packs comprising three Cadillac engines in a clover-leaf Perrir-Cadillac design of three engine blocks clustered around a common case with a gear system that worked to a single output shaft.⁷⁴ (Fig. 8.22)

As expected GM-H produced thousands of truck cabs (24,165), ambulances (560), signal vans (1,559) and gun tractors (503).⁷⁵ Many of these were made to a Canadian War Office (CWO) design. The Australian Army Design Directorate requested GM-H make changes to accommodate weather conditions (tropics), manufacturing facilities, availability of local materials and local standards of components. The changes were overseen and documented by GM-H engineering at Woodville. Eight variations of cab were produced compared to Canada's original three.⁷⁶ (Fig. 8.23)

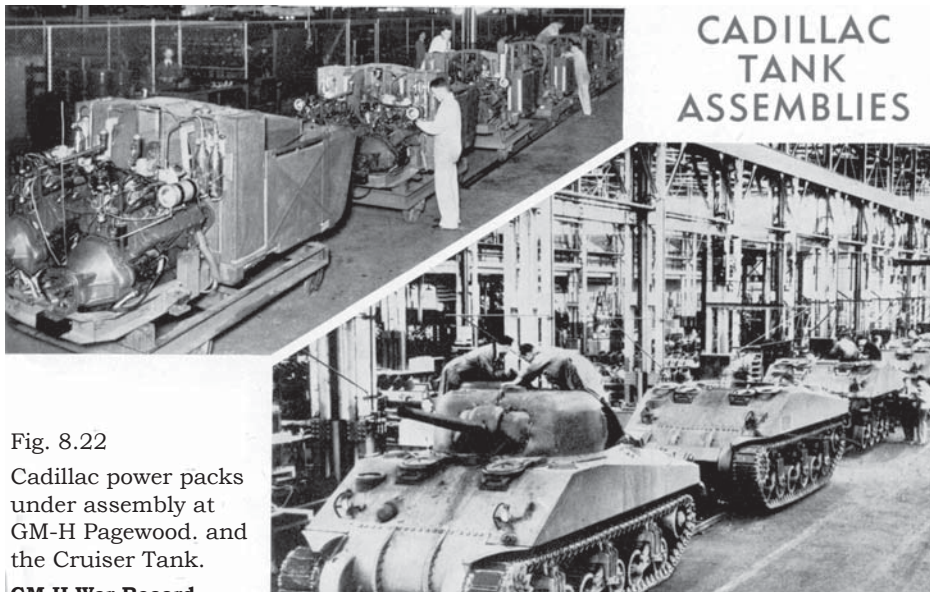


Fig. 8.22
Cadillac power packs
under assembly at
GM-H Pagewood. and
the Cruiser Tank.

GM-H War Record



Fig. 8.23
Canadian War Office cab with
GM-H modifications built for a
Bofors Gun Tractor.

GM-H War Record

Reg Hall, Holden's chief design engineer, was responsible for co-ordinating with the army design directorate in establishing designs for specialised vehicles of war. In addition to CWO cabs Holden modified Pontiac and Chevrolet sedans into army utes using both metal and timber utility beds.

Immediately following the war the industry slowed, imports of motor chassis began to arrive. English cars, minus the body, arrived from mid-1946. For large manufacturers (Ford and GM) pre-war design bodies were fitted, for small companies a body builder was sought. Singer cars, for example, contracted James Flood to build bodies from August 1946. These were a simple 2-door tourer that seated 4-passengers on a 10hp chassis. Flood improved the comfort by using a newly patented glass in rubber side curtain made by E R Crispe & Co of Adelaide. Side curtains traditionally used celluloid that went opaque, became brittle and were generally draughty and leaked. The Singer Super-Ten tourer was unique to Australia.⁷⁷ (Fig. 8.24)

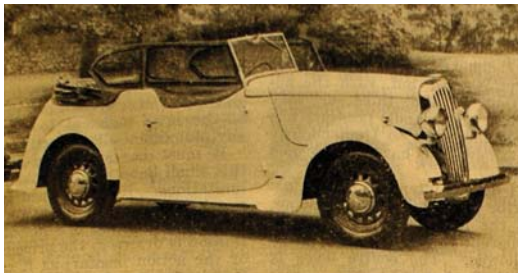


Fig. 8.24

James Flood built Singer Super-Ten Tourer fitted with patented E R Crispe & Co "Rubber in Glass" side curtains.

The Coach & Motor Body Builder

Holden prepares

General Motors-Holden did not suddenly decide to produce an Australian car in 1945 when the Australian Government asked for submissions. Planning can be traced back to 1935-1936 when a proposal was hatched by the Labor Government to sell wool to Germany. To balance trade, it was agreed Holden would import GM Opel components. Originally, the design was to be based on the Opel Olympia though after a visit to Germany, Hartnett suggested a change to the plan:

The area we are shut out is that Morris 8, Tourer/Roadster about £240. Vauxhall cannot help us, so I feel the Opel Kadett conventional axle and springs but with a pepped up motor, effective about January. We make the entire under-body,

importing only those bits that help us cost-wise, say, engine hood, perhaps fenders, etc. Then develop a low-cost two-door body at the lowest possible cost. A sort of tourer with a tin roof.⁷⁸

The matter was seriously investigated using the Kadett to be followed by a new Olympia design in 1939. Holden engineers and planners went to Opel in 1936, but when relations between Britain and Germany deteriorated, and objections from the Minister of Trade, Sir Henry Gullett, that the deal would offend the British manufacturers once it became known, the whole idea was dropped. Gullett believed GM-H intended to import the complete Olympia but he had it wrong; Hartnett announced in early 1936 Holden would not proceed with the plan.⁷⁹ Before 1936 was over, Hartnett and Val Stacey were at Opel, most likely discussing the proposal.

At this time a young GM stylist arrived in Australia, Hartnett having agreed to Franklin Hershey's trip, believing it would assist the Holden stylists to adopt the American approach to new model development, presentation and approval. Hershey was a born artist who found work in 1928 with Walter M Murphy & Co, custom coachbuilders who produced custom bodies for Cord, Duesenberg and Minerva. After Murphy's demise in 1932, Hershey worked briefly for Hudson Motor Car Company and then joined GM's Pontiac division where he revitalised the 1933 models by adding valances to the fenders and a V-radiator grille.⁸⁰ In 1935 Hershey added the Silver Streak moulding that ran up the grille, along the bonnet and down the boot lid. This feature stayed with Pontiac until 1956 (although by then it was two mouldings, one on each side). In 1936 Hershey was appointed the Chief Stylist for General Motors Overseas Operations (GMOO). His first task was the styling of the new unitary constructed Opel Kapitän and he then spent two years visiting Vauxhall, Opel and Holden as the GMOO styling supervisor. His trip to Australia took place from April 1938 and was to: "help organise a small styling staff there. I trained the design staff and also helped them pick colours and fabrics and make models".⁸¹

The result of Hershey's visit can be seen in the set-up of the Woodville styling studios and 1/8 scale models, including a model of a Norman Bel Geddes design, multi-scale sketches of new body styles and presentation folders of the Engineering/Styling effort for the year. (Figs. 8.25 - 8.29) Following Hershey's visit an art studio was established in Woodville as part of the engineering area with Alfred Payze, Frank Mathwin, Frederick

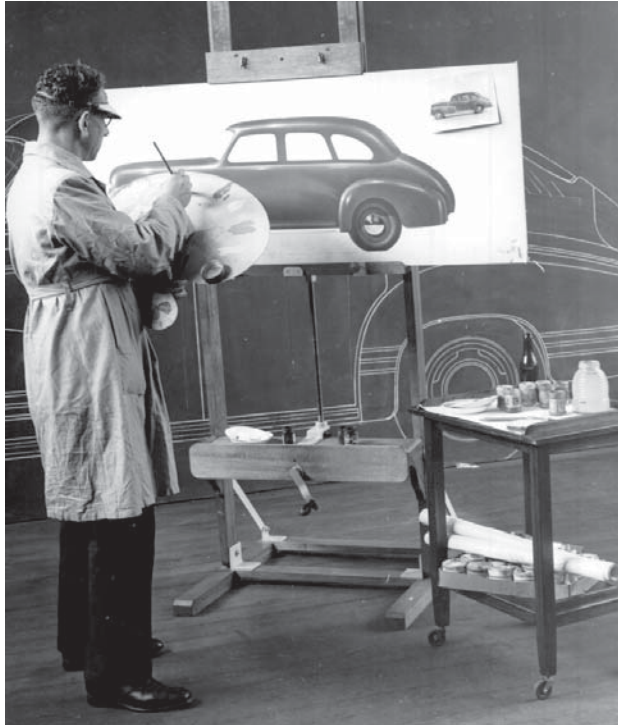


Fig. 8.25 & 8.26

Above Left. Holden Styling Studio Woodville March 1945. Possibly artist Fred Stoward working on a rendering of the proposed Holden model.

Above. Jack Burgan at a drawing board.

GM-H Project 2000 folder



Figs 8.27 & 8.28

Scale models under construction in the Woodville Styling studio and on show. Note Bel Geddes model third from left.

GM-H Project 2000 folder



Fig. 8.29

Left. Holden Art and Colour Studio Woodville c1945. Left to Right. Fred Stoward?, unknown, Frank (Gill) Mathwin (standing), Alf Payze and Jack Burgan.

GM-H Project 2000 folder

Stoward and Jack Burgan employed as illustrators. Payze and Burgan were trained draftsmen, Mathwin and Stoward graphic artists, Mathwin within three years would head the section called Styling – Art & Colour.

When war erupted Holden already had plans for their own car and by April 1940 a detailed *Car Manufacturing Study – Vol II* had been completed by the Engineering department.⁸² In fixing the position of the proposed car in 1939, engineers plotted the curb weight versus engine displacement of 10 popular cars on sale in Australia and two future GM models. These ranged from the 14/4 Standard, Willys, Studebaker, Chevrolet and Ford V8. A graph plotted showed the mid-point of 155ci and 2,700lbs curb weight. Holden thus selected a curb weight of between 2,650 – 2,750lbs and a horse power of 22.5 from a capacity of between 140-155 ci. This then led to a target of 28-30mpg at 40mph and between 91 and 93 cubic feet per ton mile.⁸³ (Fig. 8.30)

Ten factors were considered; market, topographical conditions, climate, roads, fuels, legal requirements, service considerations, manufacturing considerations, material availability and styling as number ten.⁸⁴ Several styling drawings of a sedan and coupé utility were included at the back of the folder and show American styling in keeping with the trends of the US GM 1940 models. The initials CFB are on the drawings and are those of English stylist Charles Frederick Beauvais who immigrated to Australia in 1937.⁸⁵ (Fig. 8.31) The appointment of Beauvais also followed Hershey's visit to Australia. He was established in the Melbourne drawing office, initially to style commercial and special body jobs, such as the Governor General's convertible Buick with a Vauxhall 25 front. Beauvais found himself working directly for Hartnett on project 2200.

The basic specification for GM-H's 1943 proposal, coded Vol. V and later named project 2200, was revised within 3 months to a longer wheelbase of 111.5-inches, curb weight of 2,900lbs and 22hp. The larger dimensions reduced the fuel economy projection to 25mpg.⁸⁶ Holden's styling section prepared a sketch showing a pre-war American styled sedan. (Fig. 8.32) Also included in the study are photographs of two 1/8 clay models produced and labelled 1943 by the Woodville Styling art studio. These depict post war English styling.⁸⁷ (Figs. 8.33 & 8.34)

Graeme Davison points out that the public mood was tapped in 1942 and early 1943 when the Morgan Gallup Poll surveyed the Australian public

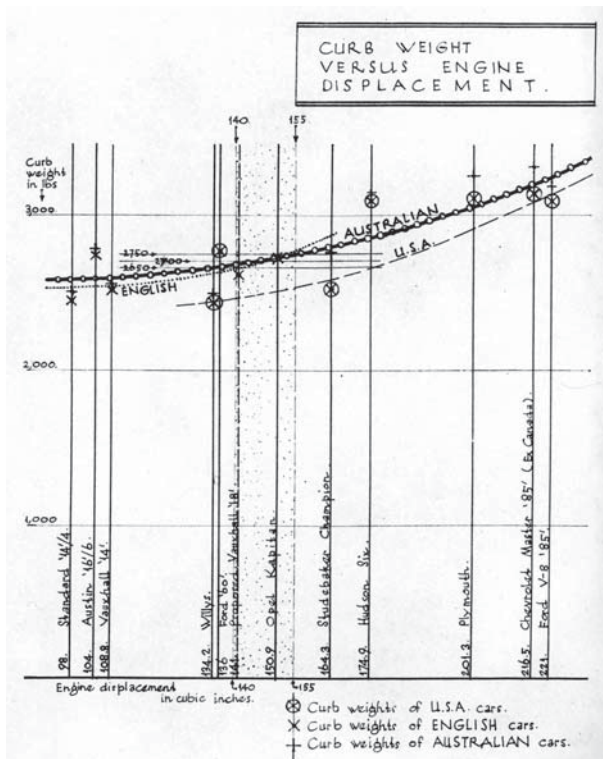


Fig. 8.30
Graph of performance.

GM-H motor car manufacture in Australia folder Vol 5. July 1940

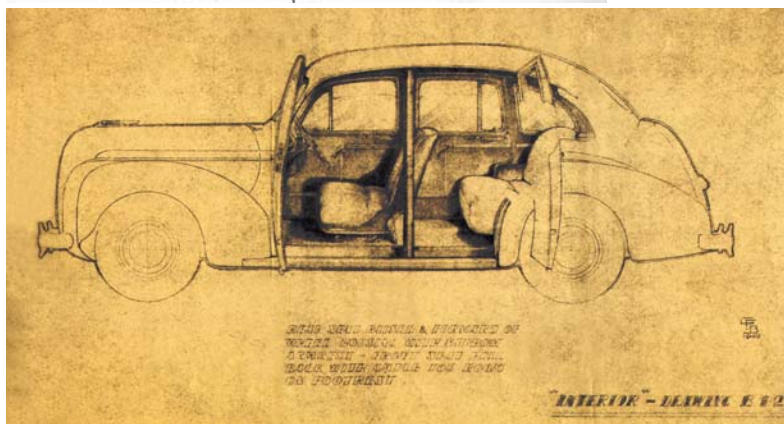
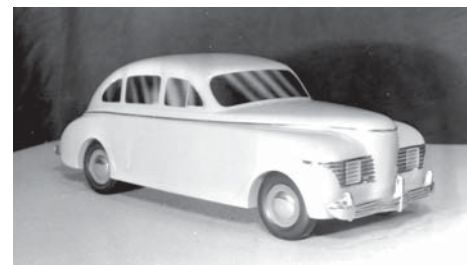
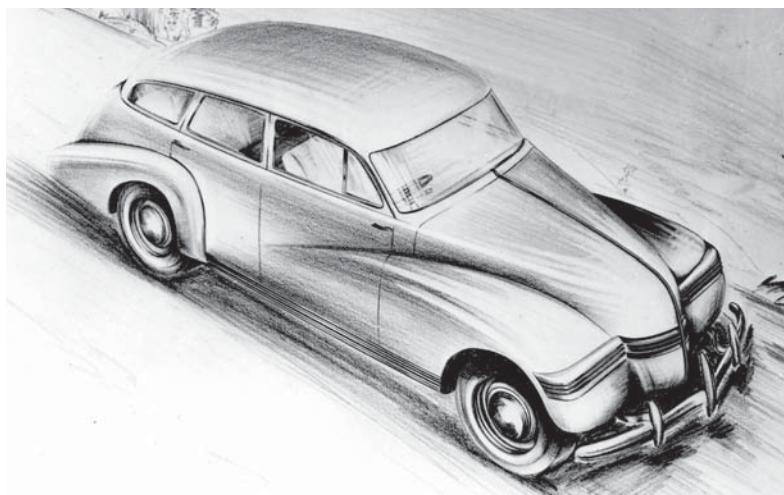


Fig. 8.31
Left. Drawing B123 by Charles Frederick Beauvais.
GM-H motor car manufacture in Australia folder Vol 5. July 1940

Fig. 8.32
Left below. Sketch of 1940 car proposal.
GM-H motor car manufacture in Australia folder Vol 5. July 1940



Figs. 8.33 & 8.34
Right. Two 1/8 clay model versions of the 1943 car proposal.
GM-H motor car manufacture in Australia folder Vol 5 July 1940

as to their personal goals and expectations in the post war period. While a new car was down the list it was still a lively presence in the imagination of the respondents.⁸⁸ A subsequent Melbourne *Herald* and *Argus* newspaper request for readers to advise their ideal car, revealed a specification close to what GM-H took to Detroit in 1944 when seeking approval to build the 1948 Holden.⁸⁹

Speculation about an Australian car was rife following the war, Alfred (Les) Spooner, a former body builder and draftsman, writing in *The Coach and Motor Body Builder* suggested a car should be front wheel drive, use a 12-14hp 4-cylinder engine, be simple with no gadgets, have an integral frame and wheel base of between 102-106 inches. His drawing of a proposed car reflects English pre-war airline styling.⁹⁰ (Fig. 8.35)

It is clear from the two-car studies that GM-H was preparing for a short period of conflict and return to peacetime by 1943. When this did not materialise all thoughts of an Australian car were put on hold until the end of 1943. It is also clear that Holden had a team of engineers, designers and stylists who were experienced and capable of producing a complete motor car. This expertise would be reinforced through the production of war-time munitions when the Holden personnel, despite claims from overseas that they would be unable to carry out some complex aspects of engineering, defied expert warnings and completed vital projects. These included the Gray Marine Diesel engine and its complex injectors, all manner of artillery including making the optical sight glass, torpedo engines, aircraft engines and aircraft components and fighting vehicles.⁹¹

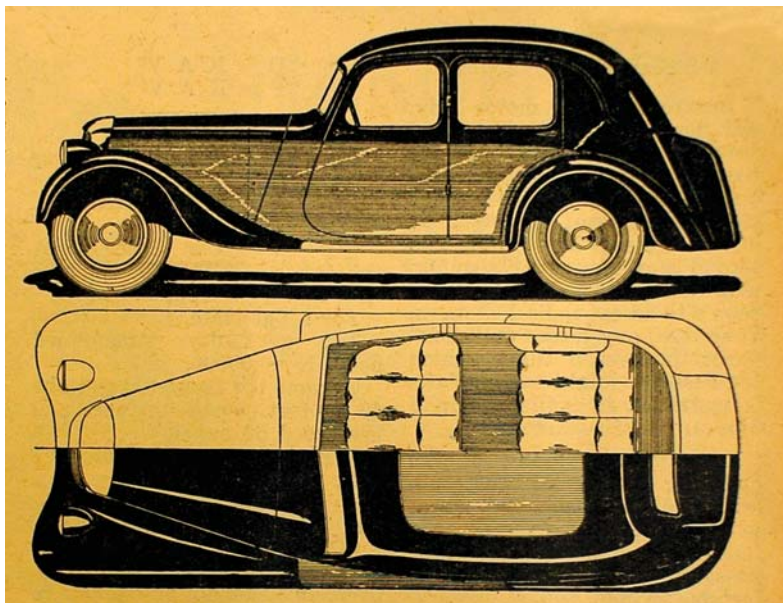


Fig. 8.35
Les Spooner's Australian Car.
**The Coach and Motor Body
Builder**

Opel influence on the future Australian car

John Wright believes the 1936 Opel Olympia was the most significant car created by GM since the 1927 6-cylinder Chevrolet: “Its relevance [in terms of the Holden story] can hardly be overestimated”.⁹²

The Olympia was a mid-sized light car and the first GM product to utilise unitary construction: this design first appeared on a mass-produced car (Citroën Traction Avant) in 1933.⁹³ (Fig. 8.36) Opel were able to develop the design (all-steel unitary) through links with Ambi-Budd the German division of American firm, E G Budd Manufacturing Co. Budd had first produced an all-steel body for Oakland and Garford in 1912 and then mass produced Dodge bodies from 1915.⁹⁴

GM’s body division, Fisher Body, did not produce an all-steel body till August 1935 for the 1936 models, that still carried some wooden components in the roof.⁹⁵ The engineer driving the Olympia’s body design was Russell Begg, a man well acquainted with Budd’s body work as he had been Chief Engineer of the Budd Wheel Corp from 1928.⁹⁶ The Kapitän followed the Olympia, the first GM vehicle to embrace both unitary all-steel construction, wishbone front suspension and a 6-cylinder engine. Wright suggests it is this car that is the true predecessor of the Holden and that the Kapitän design was: “Radically new.... no-one else but Begg could have done it”.⁹⁷ The Vauxhall J-Type 14hp 6-cylinder preceded the Olympia by just a month in October 1938, though the suspension was a Dubonnet system developed in 1933 and no longer considered modern in 1938.

The Opel unitary body design of 1935 featured a hat sectioned frame welded to the underbody with two brace wings on either side of the engine bay. (Fig. 8.37) Budd company designer, Theodore (Ted) Ulrich, patented his *End Wall construction for vehicle bodies* in 19 February 1938.⁹⁸ (Fig. 8.38) Ulrich, with Earl MacPherson and Carl Cenzler worked in the beginning for Hupmobile, all three joining GM in 1934 and continuing to develop body design structure. Ulrich then joined the Budd company in time to see the Vauxhall front frame released and the creation the evolutionary Nash 600 body. (Fig. 8.39)

Ulrich built onto the work done by Budd chief engineer, Joseph Ledwinka, who developed a 1931 front wheel drive unitary concept car, a design concept used in the Citroën Traction Avant. Concurrent with Ulrich’s work was a design by GM body engineer, Charles L Waterhouse Jnr, who



Fig. 8.36
Citroën Traction Avant unitary body.
Citroën

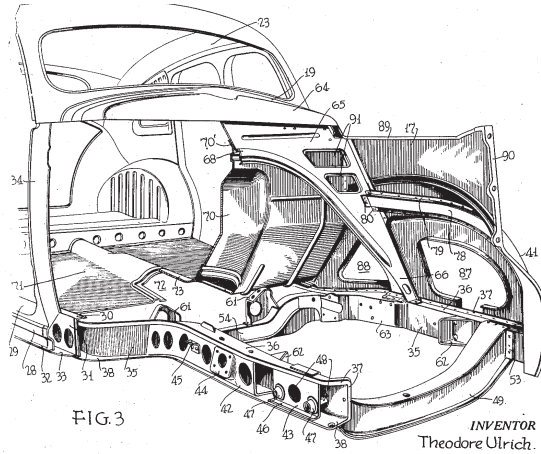


Fig. 8.37
Above. Ted Ulrich "End Wall" patent drawing of 1938.
US Patent Office No. 2,383,029

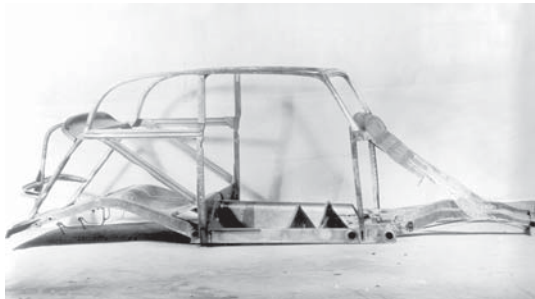


Fig. 8.38
Left. 1937/38 Opel Olympia unitary frame.
GM Opel



Fig. 8.39
Left. 1937 Vauxhall unitary body.
GM Vauxhall

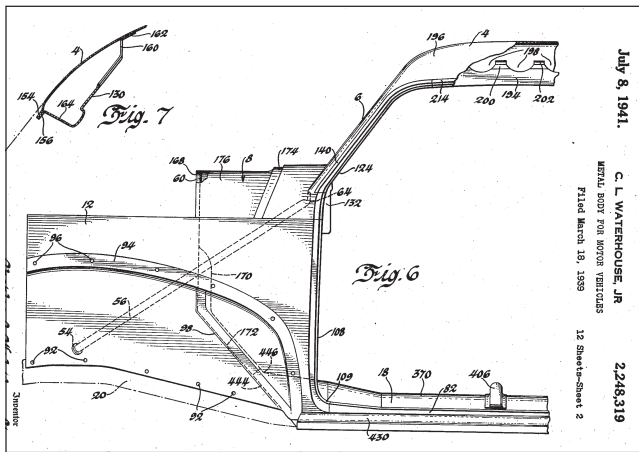


Fig. 8.40
1941 Charles Waterhouse patent drawing.
US Patent Office No. 2,248,319

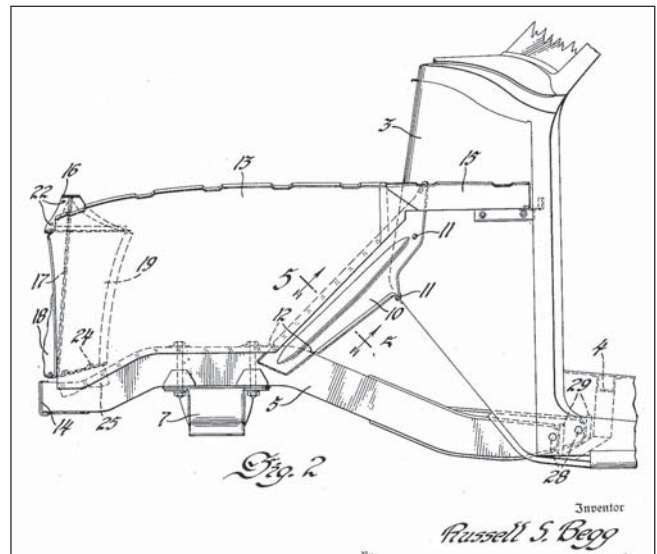


Fig. 8.41
1946 Russell Begg patent drawing for bolt-on front frame.
US Patent Office No. 2,539,050

patented a new design in 1939. (Fig. 8.40) Waterhouse simplified the side braces, incorporating a tube brace into the side panels. His work was destined for the Chevrolet Cadet, a light unitary constructed car being developed from 1945 by Earl MacPherson. The Waterhouse design could have been used on the Holden, still Begg made revisions and created his version. (Fig. 8.41). The reasons are clear; he was responding to the Holden production engineer's (Wylie) search for low cost tooling, stating "The distinct unit assembly for separately joining to the body will facilitate the ease of over-all vehicle production as well as subsequent repair".⁹⁹

The Holden front frame was unique, because the bolt-on frame using body screws and specially machined lower bolts could be sub-assembled away from the body, simplifying jigs and fixtures. The bolt-on frame saved considerable tooling, because of GM-H investing heavily in a single body plant supplying five assembly plants. If the frame was welded, specially designed racks for rail and road transport would have been scrapped, increasing the length of the body.¹⁰⁰ (Fig. 8.42)

Wright suggests that the true antecedents of the Australian car program (labelled 195-Y-25) have never been identified.¹⁰¹ This is misleading. *The History of Holden Since 1917* (1983) carried both images of prototypes 195-Y-15 and a description of Thoms Product Study Group. English GM researcher, Hayward, also explored the Thoms Light Car Project as early as 1997 as part of a thesis and later (2001) published his research online and as a three-part series in *Restored Cars* magazine. Don Loffler also published details of the Light Car Project.¹⁰²

What Wright has researched and subsequently published, is the Australian and American backstory to the Holden development program in Detroit. In 1983/4 the Holden archive was sitting in boxes in an engineering store waiting for a decision on its fate and was unavailable for research. Rightly



Fig. 8.42

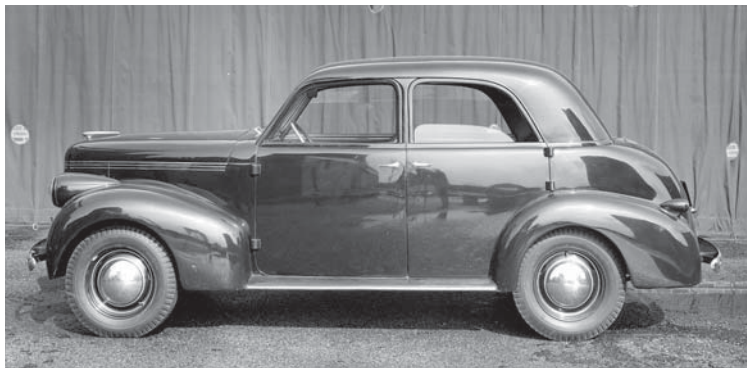
Left. Holden bodies mounted in specifically design racks for transport to GM-H assembly plants.

Holden Ltd

or wrongly Holden made the decision to move the archive to the Soputh Australian Mortlock Library and here it has been fully catalogued and made accessible.¹⁰³ From research at Mortlock Wright makes the hypothesis that the 195-Y-15 prototype formed the basis for the Holden car.¹⁰⁴ The evidence is compelling and supported by Jack Rawnsley, one of the GM-H designers who worked on the project in Detroit. Rawnsley was interviewed in 2008 and said the 195-Y-13 and 15 cars were brought across to Detroit from Opel by Begg. Rawnsley was unsure of the exact details, but explained that: “A prototype is never started from nothing, but is always based on something that already exists”.¹⁰⁵

Apparently, Rawnsley’s assumption was that Begg brought over one or both of Opel prototypes that were then developed and adapted into the Light Car Project 195-Y-13 and 15 cars. (Figs. 8.43 & 8.44) History has recorded that the Light Car Project cars were based on 1938 Chevrolet components, but now it is understood they are clearly Olympia body components. The evidence can be seen in the roof, door frames and rear door hinges. The modified grille, fenders, boot, tail lamps and headlamps are probably Chevrolet and the grille badge reads Vauxhall. This gives support to the notion Thoms group had the Olympia prototype cars modified to suit their needs.

The product study group was located behind the GM Detroit head office, in the same building as the Fisher Engineering, where photographs of the 195-Y-15 prototype were taken. Thoms’ group used the services of Fisher Engineering and Chevrolet Engineering to modify and build the Light Car Project cars. A progress report of the 195-Y-15 6-cylinder car provides an insight into the mechanical details listed by item number. [Table 8.1]



Figs. 8.43 & 8.44
Above. 1937/8 Opel Olympia.
Left. 195-Y-15 Light Car prototype.
**GM From Market, Product and Cost
data Folder - Aust Car Project 1944**

The 195-Y-15 prototype was stored and re-discovered following the arrival of the Australians in Detroit in 1944. Roy Rainsford, the technical liaison engineer, records: “We have been fortunate in locating a car which could be a good starting point for our Australian unit”.¹⁰⁶

While Rainsford appears to have located the 195-Y-15 prototype, the facts show its existence and specification were known to Hartnett and the GMOO engineering team. Begg would have also been aware of the similarities between Holden’s specification and 195-Y-15. The timing of events can be traced through memos and reports. Hartnett professes he was unaware of the 195-Y-15/13 project at his December 1943 GM meeting.¹⁰⁷ Wright maintains that Hartnett sought a cheaper, smaller 4-cylinder vehicle. Filed in the February 1940 car manufacturing study is a memo from W D Appel to H B Phillips dated 14 October 1940 with Hartnett and Abbott on the distribution list, with a reference to the prototype: “Lou Thoms and I have gone over the Australian Car Study which you sent out to Detroit. Due to its length, our major interest was concentrated on the design proposal”.¹⁰⁸

Thoms & Appel had made a comparison of project 2200 (both versions) with the 19517 (195-Y-17) specification. [see Table 8.2] The 195-Y-17 was a larger product study group proposal. Summing up, Appel notes: “The really interesting part of this similarly is that if the Overseas Group is going to go ahead with the development of a car for Australia, then 90% of the work is practically done”. The 90% obviously referred to the mechanicals and not the body as a 1938 design was already outmoded in 1940.¹⁰⁹

The Australian car development

The birth of Holden’s Australian car can be traced to a memo dated 9 December 1943 from Hartnett to his directors and Woodville chief engineer, K Stuart. The memo headed Most Secret requested the recipients select a team to actively pursue a case for an Australian car. Hartnett had returned from America where discussions with his boss, Edward Riley, and GM’s Chairman, Alfred Sloan, had encouraged him to put forward a plan to make a car when peace came. Hartnett concluded his memo:

I can assure you this is extremely important work and I feel if we undertake it with enthusiasm and ensure that it is properly executed, then the approval by the corporation to design and manufacture of motor vehicles in Australia will be much more readily forthcoming.¹¹⁰

Several days later Hartnett called a meeting with his Melbourne engineering team to discuss possible design directions for a new car. In attendance were L J Hartnett, N A Pointer, G A Quarry, R L Abbott, D Dunstan and J R Horn. The meeting's discussion notes taken by Hartnett's assistant, Jack Horn, indicate Hartnett did most of the talking, directing his engineers to investigate a car that sat between the American, too grandiose, and British a little too much the other way for Australia's actual needs.¹¹¹ Hartnett wanted BHP onside to advise on suitable steels and alternatives if availability was problematic. Hartnett also suggested engineers investigate the Renault and DKW suspension systems, an early warning that he was looking outside the GM corporate design/engineering system.¹¹²

It is worth discussing Holden's engineering and styling structure. In March 1944 two engineering departments existed; one, a South Australian group based in Woodville under Rainsford with a team of four body design engineers, four project engineers, 56 draftsmen and five artists (stylists) who worked on both new body designs and body production engineering; the other, in Melbourne, the former Commercial Body Design group (nine people) that had been expanded under Norm Pointer and included three body design engineers, four mechanical design engineers, two project engineers, 47 draftsmen and one artist (stylist/modeller).¹¹³ Hartnett's initial enthusiasm was for the mechanical design as he believed his body engineers did not need to seek outside design assistance. Consequently, he only engaged his Melbourne engineering team. As the project developed it became necessary to relocate most of the Woodville design team to Fishermans Bend, while those that remained in Woodville performed the production engineering function.

Pointer wasted no time and on 21 January 1944 met with his Assistant Chief Engineer William Abbott, Chief Draftsman Charles Phillips, Executive Engineer George Quarry, Chassis Engineer Clifford Kaye, mechanical engineer Geoffery Roper, project engineers Charles Paterson, Neil McArthur, and D Dunstan with Jack Rawnsley acting as secretary. [see Attachment II for biographies of designers] The group discussed a substantial report *Progress for light car project* that had been assembled in three weeks. Under Personnel the report recorded:

It is recommended that Australian technical personnel visit U.S.A. for discussions and determination of the program. Wherever necessary American personnel should be selected by these people to assist as consultants or as direct supervisors.¹¹⁴

Between February and June 1944, the Holden Light Car Project team put together a series of reports and studies under the heading of *Car Manufacturing Proposal Part 1*, now held in the Mortlock Library under BRG 213/65/6/1.¹¹⁵ The specification that went to America particularised a 104-inch wheelbase car with a curb weight of 2,100lbs, and a 6-cylinder 132.5ci engine that would return 30mpg. The submission was largely based on project 2200 data but had been modified to reflect 1943 thinking, that incorporated an integral frame, meaning it was to be of unitary construction.¹¹⁶

By mid-1944 Hartnett, in a file note, *Recommended future program for Australia*, outlines his thoughts to the GM-H board. These embraced:

I am thoroughly confident that technically the organization in Australia, with assistance from the United States, will be able to effectively undertake the work of producing a satisfactory product and at a satisfactory cost.¹¹⁷

Nevertheless, Hartnett reveals a fear that GM may not approve his car proposal on the basis that they may consider it hazardous and this being the case and based on pre-war methods of operation, would close up. Hartnett then suggests GM-H could sell out to local shareholders and build a local product under a licence.¹¹⁸ It is clear that Hartnett was committed to building an Australian car with or without GM backing.

Hartnett, with a GM-H submission for an Australian car in hand, left Australia with Clifford Kaye and Valentine Stacey in early July, arriving in New York on 7 August 1944. The group spent the next six weeks working with the GMOO Planning and Development staff on a formal presentation to the GMOO Policy Group on 20 September 1944. GM had a specific structure for the presentation which was bound into two volumes, *General Motors Overseas Operations Post War Planning – General Motors in Australia*, a 75-page study of Australia, Australian culture, industry, climate and Holden's manufacturing capability.¹¹⁹

The supporting folder, *Market, Product and cost data related to projected motor car manufacture in Australia* numbered 98 pages and held detailed specifications, cost data, sales projections, financial considerations, manpower and investment requirements.¹²⁰ On 25 October 1944 Hartnett presented his case to the GM Post War Planning Committee, the first step in gaining approval for the Holden car. Having passed this test GMOO immediately put in motion the process for designing Holden's light car.

Shortly after the October approval Hartnett wrote a procedure for handling the design and engineering in Detroit. This clearly indicates the intention to use the 195-Y-15 prototype as a starting point, Hartnett writing:

With the object of modernizing and modifying the engineering and design of experimental car 195-Y-15 for manufacture in Australia, it is proposed to set up an engineering team in Detroit within the overseas group, which will consist of American personnel together with Australian engineers and personnel to come up from General Motors-Holden.¹²¹

Hartnett lists American engineers, Gerhardt Kuiper (experimental), Oscar Kries (engine), Milton Trisher (carburettor) and Maynard as a proposed Chief Engineer as all had previously come from Opel. This suggests Hartnett was aware of the 195-Y-15 origins and the engineers who were involved. Hartnett also suggested GMOO staff engineer, Kublin as Assistant Chief Engineer. Kuiper, a Dutch trained engineer, is the only designer of this group to have any recorded details. He was hired by Begg as part of the Jordan Car Company set-up and from there moved with Begg as his Assistant Chief Engineer.

The supporting GM-H bound folder (dated December 1944) contains both GM-H and GMOO prepared pages. A set of photos was added including a photo of a pre-war American prototype (195-Y-15) and a GM Styling sketch

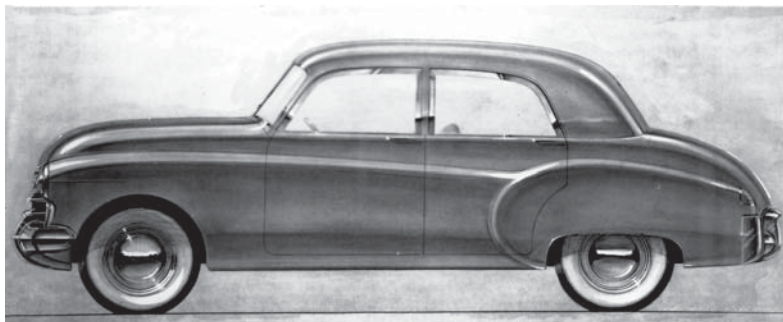


Fig. 8.45
1945 drawing by Frank Hershey of proposed Holden car 195-Y-25.
GM - From Market, Product and Cost data Folder - Aust Car Project 1944

for a proposed Australian car. This sketch is based on the Holden project wheelbase of 104-inch and was prepared by GMOO stylist Frank Hershey after 25 October 1944. (Fig. 8.45) Accordingly, it is obvious that GMOO engineering were working on Hartnett's proposal from at least August 1944. This presentation is, however, based on a revised 195-Y-15 spec (project number allocated by GM). The two proposals are side by side, 195-Y-15 and Holden's proposal, and both are unitary construction. The major differences, and they were insubstantial, were in the wheelbase, tread, and overall length. (see Table 8.3)

The changes for Holden were made between their September 1944 submission and the earlier 1940 Project 2200. It is evident that the submission Hartnett took to Detroit and based on Project 2200 was considerably modified by GMOO. Changes encompassed moving to unitary construction, shortening the wheelbase by 7.5-inches and length by 15-inches, tread reduction by 5-inches, curb weight by 800lb. Clearly, GMOO were convinced a smaller package was required.

On the 19 December 1944 GM approved the Australian Car Project. The Chairman, Alfred Sloan, wrote to Riley five days prior to the decision expressing his concern on the Australian's proposal:

So far as I am concerned, and I think the group agree, that if we can go into this project on the basis of free enterprise, having the right to manufacture as we see fit, to sell at prices we see fit, and to do our engineering as we see fit without prejudice against us and without prejudice in favour of others in a similar position, then it is one thing, but if we are going to be hamstrung by all kinds of reregulation, it is quite another.¹²²

A week later, 26 December 1944, GM Styling commenced work on ¼ scale drawings based on Hershey's sketch.

On the same day when GM approved the Australian car, Charles Phillips, Holden's chief body draftsman arrived in America aboard the SS Mirrabooka. It took 6 weeks to get there which means Phillips departed early November, just after the October Planning meeting approval. Three more Australian engineers followed, also by ship (it was difficult to get passage at this time which explains why they were separated). The project now moved quickly with GM Styling completing a ¼ size side view of the

Australian car on the 10 January 1945 and then a full-size tape drawing, that was approved on 25 January 1945. Further Holden staff arrived, Frederick James - powertrain engineer on 12 January 1945, Thomas Wylie production engineer and Abbott assistant chief engineer, both on the Admiral WS Benson via India, on 2 February 1945. At this time there were six Holden engineers in Detroit with more following. The issues of who would lead the Australians and Americans had been discussed by Appel, GMOO chief engineer and operations manager, E S Hoglund in October 1944. Appel was keen that those Americans who joined the project in Detroit should provide specialist know-how, which is not available in the existing Australian personnel. Appel also suggested the chief engineer would have a well-rounded experience with the various problems that he would be confronted with.¹²³

As it transpired the right man for the job was sitting basically idle in the product study group having returned from Opel in 1939 when war erupted. Russ Begg, an engineer with considerable body structure experience and fresh from seeing the Opel Kapitän release, was then chief engineer of special projects working for C L McCuen, whose experience with Budd and Opel designing unitary constructed vehicles made him a logical choice. It is reasonable to propose that by the end of 1944 Begg has been assigned the job of chief engineer on the Australian Car. The appointment of other Americans, including Kuiper occurred in December 1944.¹²⁴ Hartnett proposed 19 Australians including seven mechanical engineers, a chemist and metallurgist. In due course just 13 Australian design engineers and draftsmen joined the Detroit team, they were described by Hartnett as experimental and qualified sheet metal engineers and designers.¹²⁵

The issue of Australian designers in Detroit was raised by GMOO Operation's Manager, E S Hoglund, in a memo to the GMOO Chief

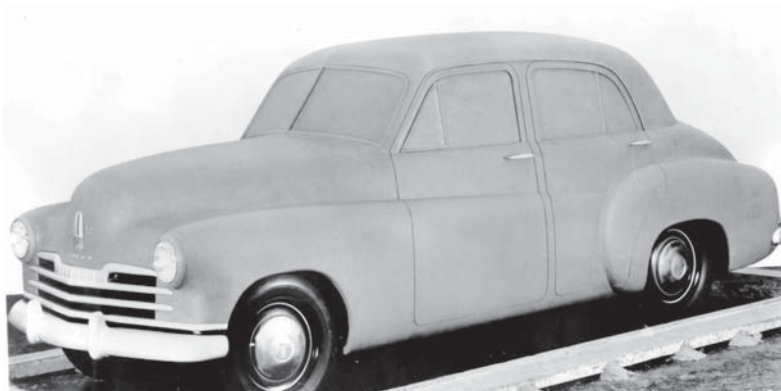


Fig. 8.46
February 1946 full size clay model of proposed Holden car 195-Y-25 with ANZAC badging and Hershey's style line through the doors, wide bumpers and long rear fender.
GM

Engineer, Appel:

The outline¹²⁶ generally conforms to the understanding arrived at in Mr McCuen's office. I take exception, however, to the statement in the third paragraph on p 3 in which you state it is desirable to keep the number of Australian technicians to a minimum to avoid confusion. I think we must be careful, as we are developing this program, that we do not treat the Australians as a necessary evil, but realize that they have a real function to perform both in the development phase of the program, as well as in preparing them to better do the job in Australia when it becomes the full responsibility of the Australian operation.¹²⁷

Work commenced on a full-size clay model on 23 February 1945 and was completed on 13 June when it was photographed with ANZAC badging. (Fig. 8.46) The image reveals a front fender swage running through the door and a pronounced rear fender, both features from Hershey's sketch that were eliminated due to tooling constraints. The removal of styling features opposed Harley Earl's brief. Riley took Holden's side, Quarry reported to Hartnett:

Mr Riley has taken a firm stand with Mr Earl for the incorporation of some features specified by overseas as essential for overseas market, and the deletion of certain features considered unattractive for overseas eg. down swept crease line, massive front-end treatment etc.¹²⁸

The clay model also depicts the Holden grille badge on the bonnet, almost complete except for the Lion. This badge came from the still-born 1941 La Salle and was probably added by Hershey, who was at the time transitioning to the Cadillac styling studio.¹²⁹ From the American's perspective, Holden's Fishermans Bend engineering were only involved with the testing program and the building of two Australian prototypes from American produced components.

Drafting layouts were drawn by Reginald Hall, Phillips and Roy Rainsford, most likely in the Fisher body drafting office. Together with Wylie, the body designers applied over 15-years body design experience in the structure ensuring the Holden would meet all durability test requirements. To develop the car in Australia, Project 320 was approved by GM-H on 9

March 1945. At Woodville the Holden styling office was also working on the development of the Holden, producing clay models and a dummy body with seats, instrument panel and boot. The dummy body was an indispensable part of the trim development. The timeline of the Holden car's progress was exceedingly quick; typical for a new car in this era, from a concept sketch to a full size working prototype took only 29-30 months.¹³⁰ The Holden program was achieved in just 22 months.

The move from a design with a frame (chassis) to unitary construction was rational given the size of the projected Holden. GM-H engineers built a local version of the pre-war Vauxhall with this design. In what appears an odd move, the body, minus the front frame, was used with a full chassis.¹²⁷ From day one GM-H wrote their specification with a frame, largely due to their desire to have one underbody structure for both sedans and utilities. By the time Hartnett explained his presentation to the GMOO engineers, the Holden was specified with an integral body with a front-end frame. This was described as: "front-end frame attached to underbody at front door pillar and to struts extending from windshield pillar, completely insulated from body with rubber".¹³²

The change to an insulated mounted cross member rather than rubber mounting the front frame came after Begg was assigned chief engineer and prior to the writing of the GM-H Product Program.¹³³ From this same presentation came the sketch prepared by Hershey, titled, *Outline drawing of projected Australian G.M car*. The sketch includes a Hershey style rear tail lamp (a style that Hershey drew for the 1949 Cadillac) and for 1944, advanced styling - long bonnet, close fitting deep bumpers, long boot, low rear wheel arch and a full body length style line. All Hershey's visual keys would be eliminated to save tooling costs by the time the styling model was approved.

The styling was also dramatically different to that proposed by Hartnett. While no sketches of the Australian design exist, a series of eight 1/8 clay models, numbered 2000 to 2008, were made and photographed. Based on the 2008 model Hartnett approved a full-size prototype that was constructed at Fishermans Bend sometime after June 1945. On this date engineering produced a report, *Project 2000 - Model Approval'* a 16-page document that included the clay model and seating buck images but not the running car. The summary recorded: "The final Model Number 2008 was approved, which permits proceeding with chassis and body layouts and body detail drawings for the experimental model".¹³⁴

In May 1945 Holden had sent the 2008 eighth scale model to Detroit believing it would be acceptable. This was in direct contrast to the work in Detroit where by February 1945, a full-size clay model of the Holden proposal (coded 195-Y-25) using Hershey's general shape is underway. (Figs. 8.47 & 8.48) Hershey remained connected to the project even though he was assigned to the Cadillac studio, advising on changes to the original styling sketch.

A formal GM-H approval for styling proposal 2008 was made on 1 June 1945 by the Holden directors and chief engineer Rainsford.¹³⁵ The report included photographs of the eight clay models, the dummy body, the blackboard outline comparison on the Australian 2200 and 2000 models, the American styling sketch and the 195-Y-15 car. If Hartnett thought the Australian styling was going to be accepted, he was clearly wrong, and it was perhaps this attitude that started the inevitable path to his resignation in 1947. Despite being told by Detroit that the US styling was being used, Hartnett secretly had his 2008 proposal built into a working prototype. An image appears in his book and recently a film clip was found showing the 2008 prototype being driven.¹³⁶ Hartnett also had his stylists, under Gill Mathwin, produce commercial variant sketches and clay models of project 2008.¹³⁷ The experimental workshops also built a station wagon version that Hartnett, in June 1946, congratulated Rainsford on an excellent job done as Hartnett had taken the vehicle home and shown it to several farmer friends around Frankston.¹³⁸ No photos exist of this vehicle but Gill Mathwin's styling sketches were reproduced in the *Model Two thousand & 8 Styling folder*.¹³⁹ (Figs. 8.49 & 8.50)

Hartnett always thought his design would triumph, even recording:

It was agreed in Detroit that styling of the new car, sheet-metal work and all things practised for years in Australia would be carried out at the Australian end, and the mechanical side would be carried out in Detroit by a combined team of Australians and Americans.¹⁴⁰

GM was not taking any risk, putting Begg in charge and selecting Hershey as stylist and a team of American engineers to produce the electrical, engine and drive line components, that would ensure the car would meet American GM accepted practice. The body development and aspects of the suspension was a different matter. Holden had proved their body

design was superior to the Fisher Body from a low volume tooling cost perspective and that Australia's road conditions required specialist knowledge. Accordingly, it was agreed a team of Australian body engineers and draftsmen would work under Begg's supervision in America, and for this reason GM-H body engineering personnel, Kaye, Quarry, Phillips, Stacey, Wylie, Rainsford and Hall made up the bulk of designers sent. (see table 8.4) Abbott provided the expertise on steering and suspension requirements, ensuring spring rates and shock absorber valving was appropriate for Australian conditions and Rawnsley acted as assistant. Abbott said of the program:

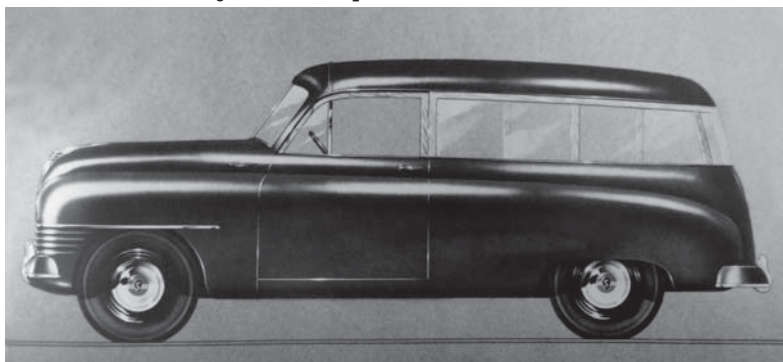
I did most of the weight and performance estimates – also a lot of the original steering. Objective was to keep car weight as low as possible, therefore we made comparative operating stress estimates, and for 1952¹⁴¹ used the highest of any used by a then current GM car giving satisfactory service. Walter Appel was Chief Engineer of GMOO and he had considerable doubts about practicability of Russ Begg's high stress-low weight approach, as it turned out, first prototype was 2,200lbs kerb wt. After durability, proving the first production cars incorporating the strengthening needed as a result of test (weight) was 2,400lbs.¹⁴²



Figs. 8.47 & 8.48

A series of 1/8 clay models were produced by the Woodville stylists. The model on the left represents Hershey's styling. The Australian versions were numbered 1 - 8 with 2008 (above) GM-H's preferred style.

GM-H Project 2000 Report folder



Figs. 8.49 & 8.50 Project 2000 station wagon sketches by Gill Mathwin. **Hartnett File - Melb Uni Bus Archive**

The key areas of body design were carried out by Hall, Kaye, Phillips, Rainsford and Wylie. All came from the Woodville Body Engineering section, established by Wylie's father (Herbert) in 1924. Wylie had started drawing in 1928 and by 1934-1935 was jointly responsible for the coupé utility and all-enclosed coupé bodies. The Australian body engineering team, both in Fishermans Bend and Detroit, continued development of body design. In May 1945 GM-H advised Detroit they had completed a wooden seating buck (dummy body) and drafted the basic body design in full size. This provided data on seating, trim design and luggage space. (Figs. 8.51-8.53)

With three prototypes of the Australian car completed in Detroit, a 10,000-mile durability test program for each car was commenced. Following testing, a tear down, inspection and reassembly of the three prototypes, and spares, including the components for three more prototypes, engineers and their families were loaded aboard the Wanganella bound for Sydney.¹⁴³ The ship docked on 28 December 1946 with cars, parts and personnel, all moved to Fishermans Bend for the start of the Australian build and test program. Less than two years later, on 29 November 1948, the Holden was released to an enthusiastic public. (Fig. 8.56) Almost immediately the car was released, changes were required, some to rectify shortcomings and to save money and others to upgrade the product. Refinements in the first 12 months included relocating the rear door lock knobs to the front of the door so the driver could reach them, revised springs, revised front cross member, improved dash insulation and body acoustics.¹⁴⁴

The 48-215 Holden ran for almost five years being replaced by the FJ series in October 1953. The only significant 48-215 additions were a utility version (model 50-2016) released in January 1951 and a business model released in June 1953.¹⁴⁵ The utility sketch was made by Mathwin and a 1/8th clay model produced at Fishermans Bend styling studio. (Fig. 8.57)

The FJ series expanded the number of models; the standard sedan, FJ-215, Special sedan FJ-225, Business sedan FJ-217, Utility FJ-2106 and Panel van FJ-2104 (released December 1953). (Fig. 8.58) Production of this first Holden and revised FJ numbered 290,371, an outstanding success leading to further expansion of the engineering facilities and approval to design and build a brand-new model, the FE Holden.

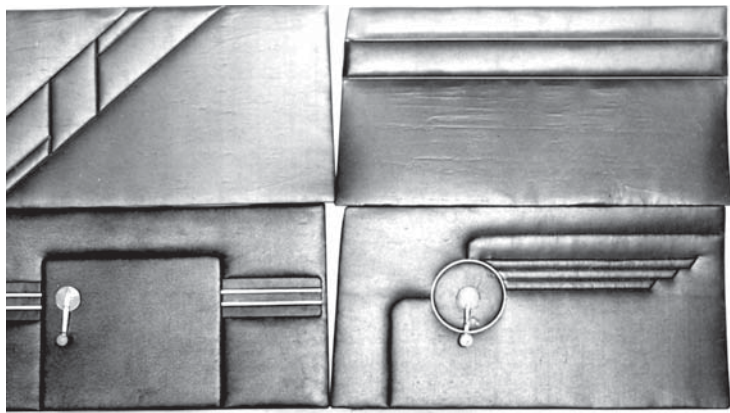
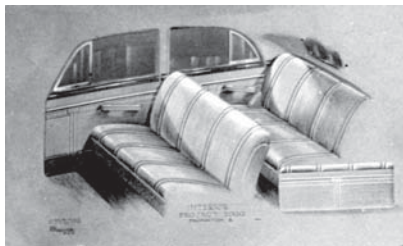
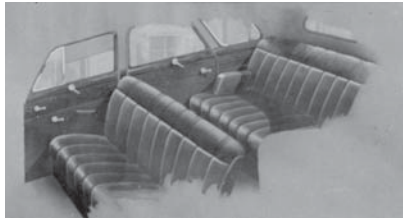
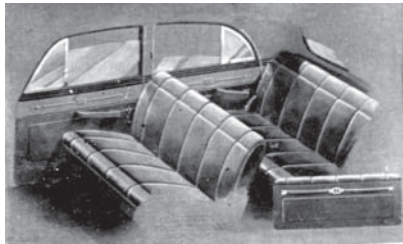
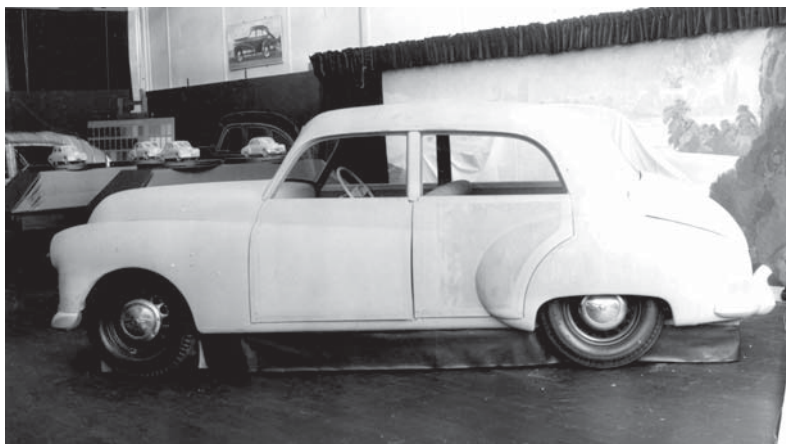
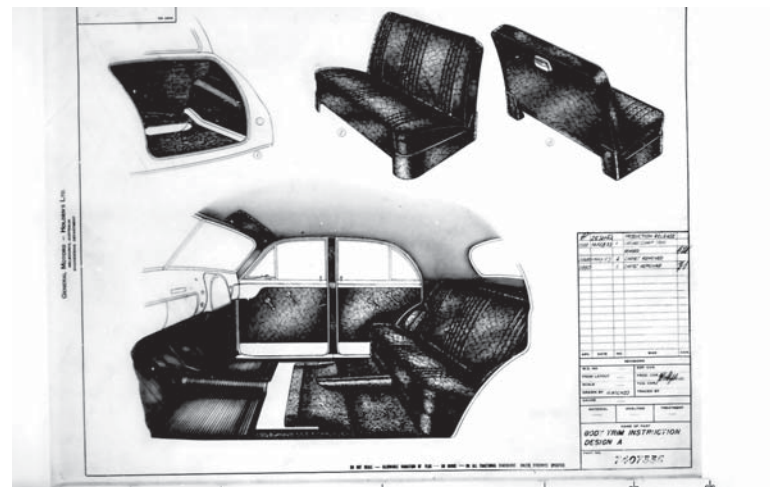


Fig. 8.51 Left. 1946 trim development sketches for the project 2000 car.

Fig. 8.52 Above. 1946 trim development seat and door panel proposals.

Fig. 8.53 Below. 1948 Engineering trim drawing.

GM-H Project 2000 folder



Figs. 8.54 & 8.55 1945 Dummy body at Woodville built, for trim development. **GM-H Project 2000 folder**

The original plan had been to facelift the FJ series with an FG model. This series would have also added an FG-211 Calèche (convertible), FG-2109 10cwt utility and FG-2300 ½ ton truck.¹⁴⁶ The decision to build a whole new body for the FE diverted engineering manpower and the additional models never saw light of day. (Fig. 8.59) A Calèche version of the Vauxhall E series chassis was designed and produced alongside a utility version, both unique to Australia. (Figs. 8.60 & 8.61)

The styling for the new FE series was performed in Detroit and two submissions in full size clay were furnished to the GM Corporation on 14 October 1952. They were based on the proposed Opel Kapitän and Holden 48-215 dimensions. Glen Smith, from GMOO, was appointed as GMOO Styling Liaison representative, spending up to three months at Holden, Opel and Vauxhall advising and assisting through the 1950s and 1960s. By 13 February 1953 Smith was in Australia with the styling drawings of both proposals, Holden opted for the B proposal with modifications.¹⁴⁷ (Figs. 8.62 & 8.63)

While the engine, transmission and rear axle were essentially the same design as the 48-215, the body, front frame and suspension members were new, likewise a number of mechanical items, steering, brakes, pedal controls and electrical system were all designed locally at Holden. The front frame assembly was designed by Thomas Molnar, a young Austrian engineer, who joined GM-H in 1952 as a draftsman and found his engineering skills were quickly applied to stress engineering. Holden were required to provide section moduli and moments of inertia for all body sections and found that Molnar was the only person who could undertake this task. Molnar's talent led him to the design of the new FE front frame;



Fig. 8.56
Holden 48-215 sedan
photographed in Detroit 1946.
GM-H

he records:

I was surprised to find that the two Frame Members (on the 48-215) were actually welded together after they had each been assembled to the body side—I knew then, that I had plenty of scope to improve! During the next few months I designed a Front Frame Assembly, which made clever use of panels, was very stiff and most of all could be fully welded together in the Body Mfg. Area and as one unit attached to the body by a number of bolts.¹⁴⁸

Molnar's design was used on successive Holden models through to the 1962 EK series without problems. (Fig. 8.64) In 1958 Molnar left Holden for Repco, eventually taking the managing director role at Patons Brakes.

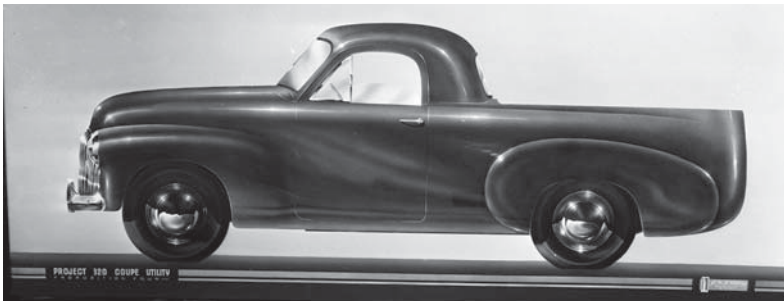


Fig. 8.57
Holden 50-2016 full size air
brush by Gill Mathwin.
GM-H



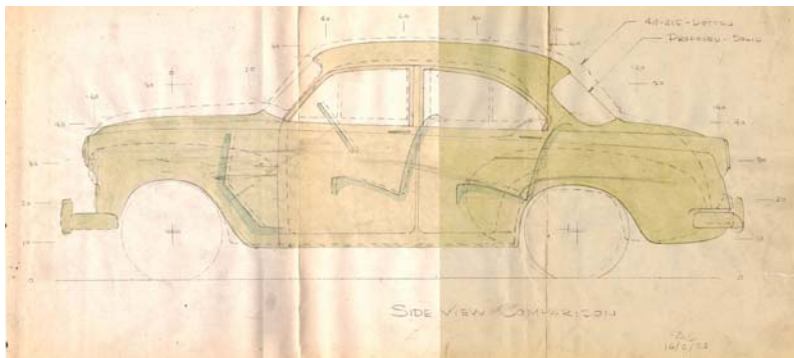
Fig. 8.58
Left. FJ grille designs in the
GMOO styling studio, some on
the wall drawn by Alf Payze.
GM



Fig. 8.59
Left. Holden FG sedan in
Detroit note lengthened rear
end.
GM - RMIT Archive



Figs. 8.60 & 8.61 Below. Holden bodied E-series Vauxhalls. The Vagabond and right a Coupé Utility, both on a full chassis. **GM-H**



Figs. 8.62
Above. FE comparison drawing drafted by Glen Smith.

Fig. 8.63
Above. FE Proposal 'B' **GM-H**

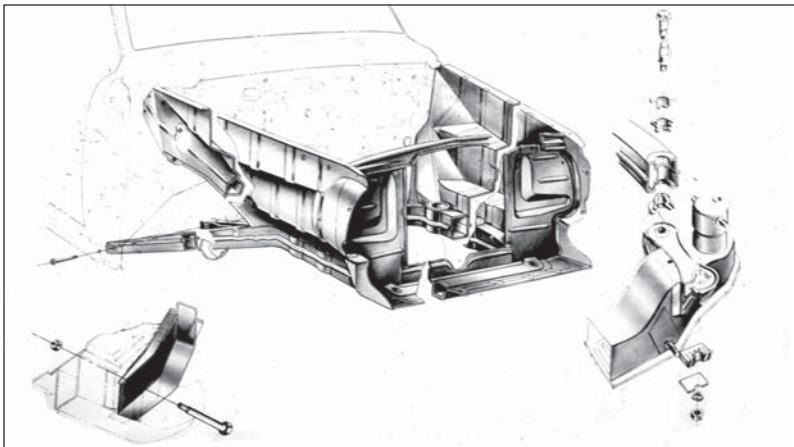


Fig. 8.64
FE Front Frame illustration. **GM-H**

Ford's response

It was sometime before a serious rival to the Holden arrived to compete on the same footing. Ford Australia initially appeared reluctant to attempt total manufacture, Hubert French thought it would be possible without Government assistance, as the problem lay in the size vehicle, the American sourced V8 or the English Anglia/Prefect. The Ford sales manager, Thomas Lamb, a trained engineer, was obviously concerned about the new Holden, writing to French in November 1947 about his view on Ford's competitiveness. Under the heading *What Ford Australia should*

do to keep abreast of General Motors in this particular field, Lamb suggested a 6-cylinder engine be developed for the V8 models:

Might we suggest that such an engine might also be acceptable to New Zealand, South Africa, Malaya and possibly Canada, especially if economical enough to give 25mpg or more. This engine could be used both in passenger and utility types up to 1-ton truck, and this model could have a distinctive name such as 'Zephyr'. It would be a dramatic answer to General Motors' move.¹⁴⁹

Lamb thought the 6-cylinder engine castings could be made in the International Harvester plant in Dandenong and an exchange program be established to swap 6-cylinder engines for British fours and Canadian V8s. Nothing came of Lamb's idea except the Ford Zephyr arrived from UK with a 6-cylinder engine in 1951. By then Ford had lost any initiative Lamb's idea contained. In 1946 French announced a £750,000 expansion to localise the American V8, achieved in two stages, 1947 and 1950. The only local design in this period being coupé utilities and commercial bodies.¹⁵⁰ (Fig. 8.65)

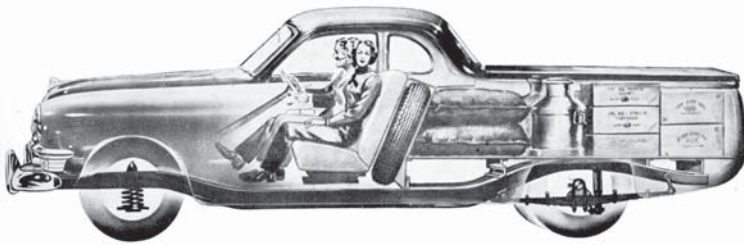


Fig. 8.65
1951 Ford V8 Coupé Utility
**Ford Motor Company - Strong
Grows the future publication**

British response

The British motor companies, apart from Ford and Vauxhall, had largely ignored Australia through the 1930s, though this changed after Lord Nuffield visited in May 1945. Nuffield announced he would get Ford manufacture off the ground in Australia even though he doubted it would make a profit. The first step was a contract with Ruskin Motor Bodies in November 1945 for Austin bodies and then in June 1947 Nuffield took a controlling interest in Ruskin, forming Austin Motor Co. Local design was many years off as Ruskin turned to CKD assembly. Other CKD assembly operations were launched at Fishermans Bend by the Roots Group (Humber, Hillman, Sunbeam, Talbot and Singer) in 1946 and Standard Motor Company (Aust) Pty Ltd in 1952. In Sydney, Morris Cars initiated assembly at the former Victoria Park racecourse in early 1951.¹⁵¹

A postscript

This thesis would not be complete without a brief word on the Hartnett car. While the basic design of Sir Laurence Hartnett's car was completed overseas, the body styling and panel shape was affected in Australia. (Fig. 8.66) Hartnett is silent on who did the panel drawings, most likely Commonwealth Engineering as they were contracted to produce them. The styling was executed by graphic designers, Graham March and Charles Furey. Furey a former draftsman and teacher, became one of Australia's foremost graphic designers through 1950-2000, even though his sketches of the Hartnett car had been largely unknown (one was reproduced in the *Shifting Gear* catalogue).¹⁵² (Figs. 8.67 & 8.68) Much has been written about the Hartnett cars' failure to see worthwhile production. A total of 551 car sets were imported from UK and assembled into rolling chassis.¹⁵³ Legal argument impeded the supply of body panels with Comeng, the principal contractor, for four years resulting in the Hartnett car's failure.

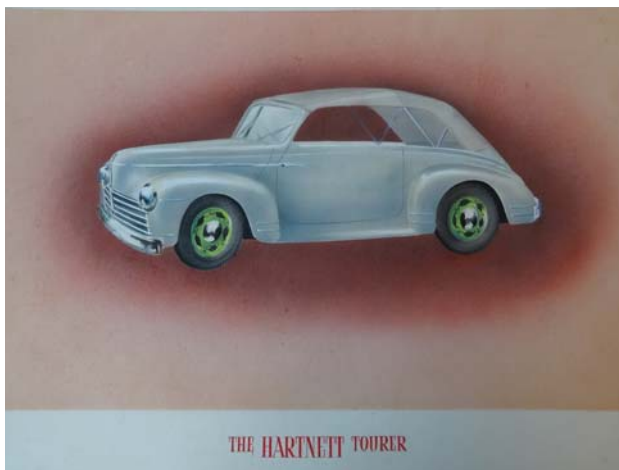


Fig. 8.66
Above. Assembly model of the Hartnett car held by the Australian National Museum - Canberra.
N Darwin



Fig. 8.67 - 8.68
Left. Hartnett touring car and utility illustrations by Graham March & George Furey.
Hartnett papers - Melbourne University Business Archive

Summary

General Motors-Holden, with Hartnett at the helm, showed a clear intent to produce an Australian car from the mid-1930s. As the 1940s approached, the two Holden engineering teams at Woodville and Fishermans Bend (which later amalgamated), began to investigate how an Australian vehicle might be achieved. A styling studio was established, sketches and clay models made and a specification developed. The war had little impact on future planning until munitions orders arrived, several providing valuable experience and facilities to design and produce a car. When Hartnett saw the war concluding, he spurred his engineers on to revising their car proposal, then taking plans to New York for GM approval in last half of 1944, well before the Australian Government sought proposals.

The team of engineers and designers credited with the first Holden's design has traditionally been named as American, the role of Australian designers obscured and unreported by GM-H. Research clearly shows Holden's designers played an important part, utilising their body structure and trim engineering skills to complement the American mechanical effort. (Table 8.4 lists the Australian body designers who worked in Detroit)

In arguing that Holden designers made a significant contribution to the first Holden, I use the following facts. The GMOO mechanical engineers complimented the Holden body engineers in terms of experience and skill. The body structure, seen in the Woodville sketches dated March 1945, is evident in Hershey's styling sketch of the proposed Australian car. The majority of Australians sent to Detroit were body structure trained. The Woodville engineering group built a dummy body for the purpose of developing seating and interior trim, while there was no dummy built in Detroit for this purpose.

The success of the Holden in the Australian market can be directly attributed to the local engineering knowledge of Australia's environment and low-cost tooling methods. GM-H built a highly successful car manufacturing business on the back of the first Holden, one that was not challenged until the 1960s when Ford, Chrysler, Rootes and BMC began local production and imports of Japanese vehicles arrived on Australian soil.

Given the facilities and technology, by 1953 Holden had acquired the ability to produce a complete car design, though in reality this did not occur until the release of the 1964 EH Holden, with a locally designed engine, transmission, rear axle and suspension.

TABLE 8.1 List of 195-Y-15 prototype mechanical features

1. Omitted
2. front-end frame attached to underbody at front door pillar and struts extending from windshield pillar, completely insulated from body with rubber.
3. Conventional front leaf spring suspension. Springs 35" long, tubular axle, double acting shock absorbers (1939 Chevrolet type), stabilizer bar.
4. Rear suspension. Hotchkiss drive. Springs 43.5" long. Banjo construction, ring gear 33 teeth, pinion 8 teeth, 2.5" prop shaft, transmission extension similar to 1938 Pontiac, single acting shock absorbers.
5. Brakes four wheel hydraulic 9" diameter 1.5" wide. Delco design. Master cylinder direct acting Delco design. Hand brake dash mounted.
6. Engine OHV 3" bore, 3.125" stroke, 132.5 cu in. 4 bearing crankshaft, balancer 1938 Chevrolet type, cast iron pistons, 2 compression and one oil ring below pin, full pressure oil, three port intake manifold, Stromberg 1" carburettor. Cam lift .2126, valve lift .3125. Three-point engine mounting, two in front and one in rear.
7. Transmission three-speed, synchronized in second and third. Ratios 1st 2.986, 2nd 1.591, 3rd and reverse direct.
8. 11 gall. Fuel tank 1.75 exhaust pipe, 1.5" rear tail pipe, cross-wise muffler.
9. Steering 17 to 1 worm and sector 16.5" diameter wheel.
10. Wheels and tyres Ford Type 15"X 3" rim 5.50 – 15 tyres 12.6 rolling radius. Other 6-volt electrical system, Harrison radiator. (Thoms 1938)

TABLE 8.2 Comparison chart - prototypes and production models

	195-Y-15	1944 Holden ¹⁴⁸	1938 Olympia	1940 Holden ¹⁴⁹	195-Y-17
Wheelbase	102	104	95.7	107	107.6
Engine Capacity	132.5ci	132.5ci	1560.9ci	149.6ci	174.2ci
Length Inches	170.5"	167.25"	181.9"	165"	178"
Curb Wt Lbs	2,077	2,100	2,676	2,400	?

Comparative data from Australian Post War Car Manufacturing Program support data folder and Phillip Appel correspondence (Phillips 1940)

TABLE 8.3 Comparative chart – proposals for Australian car

Column	(a)	(b)	(c)	(d)	(e)
Feature	Project 2200		GM Product Study		Submission
	April 1940	July 1940	195-Y-17	195-Y-15	Aust. Car
Wheelbase in.	107	111.5	112	102	104
Front tread in.	56	58	57	55.5	53
Rear tread in.	56	59	60	56.5	54
Length in.	165-166	182	178.125	170.5	167.25
Curb Wt. Lbs.	2550-2750	2900	2531	2077	2100
Clearance in.	8	8	8	8	8
Engine cyl.	6 sv	6 ohv	6 ohv	6 ohv	6 ohv
SAE HP	22.0	22.5	na	na	na
Capacity ci.	140-155	na	174.2	132.5	132.5
BHP@rpm	58@3400	na	78.5@3400		
Bore/stroke ins	3.125x3.25	na	3.25x3.5	3.0x3.125	3.0x3.125
Comp. Ratio	140-155:1	na	6.53:1	6.5:1	6.5:1
Transmission	3-speed	3-speed	3-speed	3-speed	3-speed
Rear Axle	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
Axle ratio	4.56:1	4.50:1	4.11:1	4.125:1	4.125:1
Front springs	Coil	Coil	Coil	Coil	Coil
Rear springs	Semi Elliptic	Coil	Coil	Semi Elliptic	Semi Elliptic
Frame	Chassis	Chassis	Unitary	Unitary	Unitary
Wheels in.	5.75x16	5.50X16	5.50X16	5.50x15	5.50x15

Sources: (a) Feb 1940 Car Manufacturing Study (GM-H Engineering 1940)
 (b) July 1940 Motor Car Manufacture in Australia (GM-H Engineering Dept 1944)
 (c) Letter W D Appel to H B Phillips and attachment (Appel 1940)
 (d & e) Market, Product and Cost Data report (GMOO Planning and Dev staff 1944)

Abbreviations. In. = inches Lbs. = pounds
 ci. = cubic inches sv = side valve
 ohv = overhead valves HP = horsepower
 BHP = brake horsepower na = not available
 Wt = Weight

Table 8.4 Australian design team initially sent to Detroit

Name	Roll	Arrived USA	Return
Kaye, Cliff	Body Design Engr	Aug-44	Jul-45
Stacey, Val	Body Design -admin	Aug-44	Jul-45
Phillips, Charles	Body Design Engr	Dec-44	
Abbott, Robert	Body Structure	Feb-45	Jul-45
Rawnsley, Jack	Assist Executive Engr	Mar-45	Dec-46
Sinclair, Glen	Body hardware Engr	Mar-45	
Buckley, John	Chassis Engr	Mar-45	
Quarry, George	Executive Engineer	Mar-45	Dec-46
James, Fred	Mechanical design Engr	Mar-45	Dec-46
Mason, Ray	Experimental test	Apr-45	
Paterson, Chas	Experimental test		Dec-46
Chaplin, Hartley	Body drafting Engr	Jun-45	
Hall, Reg	Body drafting Engr	Sep-45	Dec-46

Source. US Shipping entry registers - Ancestry.com

Endnotes

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- 15 Holden Model Designation 48 = 1948 215 = 4-Door Sedan Body.
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- 17 "All-Australian Car," *The Coach and Motor Body Builder*, February 1937, 223.
- 18 Laurence Hartnett, *Big Wheels and Little Wheels* (Boronia Vic: Wildgrass Books, 1981), 88.
- 19 Darwin, *The History of Holden Since 1917*; GM had first introduced this design, one that eliminated a separate chassis, at Opel in 1935. Vauxhall released the design on the 10-4 model in late 1937 and Holden produced their version on the Vauxhall 10hp car in January 1938, naming it the Wyvern. A larger 14hp J-model version was released in 1939.
- 20 "Tariff Board's Report on Motor Vehicles," Australian Government publication Vol. 6, September 1938.
- 21 Neither Ford or GM wanted local shareholding and each realised if one commenced manufacture of engines the other would have to follow, thus diluting the production volume and profit.
- 22 Watson, "Government Policy and Two World Wars: Shapers of the Australian Automotive Industry,
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- 28 Bruce Lindsay, *Chamberlain: Australian Innovator*, second edition, (Phuket: Lindsay Family Trust 2007); The Chamberlain companies were purchased by REPCO.
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- 41 "All-Australian car built by an Adelaide firm," *Barrier Miner* (Broken Hill), 3 March, 1949, 2; "Specification of Wiles-Thomson Car," *The Coach and Motor Body Builder*, May (1947), 40.
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Findings and conclusions

In his recent review of Australian design historiography *Futures of Australian design history* (2014), D J Huppatz includes little history of industrial design recording only specific studies in the radio, aircraft and electronics industries.¹ He notes, furthermore, that the history of Australian technology has thus far not attracted much interest from design historians. Similarly, my review of the Australian literature reveals numerous works on inventors, engineers, machinists, salesman and entrepreneurs involved in the automobile field but few texts that relate to design history.

Consequently, the primary objective of this thesis was to identify the origins of Australian automotive design and I have achieved this by documenting the histories of pioneers, Harley Tarrant, Herbert Thomson, Henry Sutton, Marcel Certain, John Pender and Herbert Austin. These men are identified as automobile designers using the definition established in the first chapter and developed from a definition proposed by Adrian Forty, that an automobile designer has created a structure (the automobile), using the elements of art (the visual) and science (the instruction).

A secondary objective of the thesis was to document the development of the Australian automobile industry development with a focus on design. This has been achieved through chapters three through eight.

The following sets out the findings discovered during research for this project.

Early Australian automobile designers, like the Europeans and North Americans, took design cues from the coach building industry, building their motor cars within buggies, traps and dog-carts. Initial effort lagged behind overseas endeavour by ten years but as the new century ticked over the locals rapidly caught up and by 1905 just six months' lag was evident, the time taken to sail to Australia.

Between 1900 and 1905 and again after 1918, several attempts were made to produce an Australian car and because all failed financially should not condemn their design. Australians proved they were capable of making machines of some complexity, they were adaptable in their approach to design problems, often borrowing ideas, making improvements, taking risks, dreaming and just getting on with it, despite a lack of higher education, equipment or funds. It can be argued that the early Australian auto designers were in the wrong place, too far away, isolated and considered colonial yokels by British and American company management.

There is evidence in the experiences of Anthony Michell, Arthur Bishop, Howard Hobbs and Bob Chamberlain to suggest Australian automotive designers were equal to if not ahead of their overseas contemporaries. Three of the original Holden design team, Bill Abbott, Roy Rainsford and Reg Hall led the body design departments of the British Motor Corporation, Chrysler Australia and GM-H companies respectively and that all companies had large numbers of international designers to select from is significant. The appointment in 2016 Michael Simcoe, an RMIT alumnus and GM-H trained designer, as General Motors Vice President of Global Design, in Detroit, strengthens this argument.

Almost all car design before the Holden failed due to insufficient capital, the high cost of production leading to high selling prices and poor sales. In many cases this was coupled with poor business practice. Australian efforts tended to have a narrow model range as this was all they could afford and it limited sales potential. At critical development phases the funds ran out. Innovative efforts by Caldwell, Jefkins, and Hamilton-Grapes were unsuccessful from a sales aspect and showed it mattered little how good an idea was, if you didn't have sufficient backing you failed. Others like Tarrant, Thomson and Lewis simply saw easier money was to be made selling someone else's design from overseas. A lack of capital also meant an inability to keep pace with new technology and changes in overseas practice. The exceptions were the component designers, Bishop, Northey, Hoskin, Hobbs and Moore although all were forced to find their markets overseas.

Australia did have a viable motor industry, particularly after 1917 when, with Government assistance, a profitable, viable progressive motor body building industry was established and flourished. The resulting profits attracted international companies, particularly those from North American. Recognising potential new sales for their mechanical components;; engines, axles, transmissions and chassis; GM and Ford arrived, ploughing money into Australia. This investment included design practice, buildings, machinery and technology.

The progressive Australian coach builders quickly saw the motor car's future potential, switching to motor body building, although several retained the craft methods of design and construction. A select few saw a new market for motor bodies when imported units were banned; those who reacted quickly, Holden Motor Body Builders being the first, soon dominated the industry and being the biggest meant they attracted the Americans first.

The GM-Holden arrangement was unique and even though GM held no initial financial interest in the Holden company, they provided design technology, expertise, training and facilitated new equipment. In this way Holden built a unique business, servicing GM product needs as well as those of 18 competitors. Holden acknowledged the value of engineering, establishing Australia's first automotive design drafting office and appointing the country's first trained designers, both in body design and aesthetic design.

The rise of local body design followed the introduction of mass-produced standardised motor bodies, while the need for low volume bodies continued to flow in the smaller specialised body shops. The low volume demand also required larger body builders to innovate, develop low cost tooling and design multi-use panels suitable for a range models and makes. Model differences were developed through simple add-on mouldings, pressing changes and trim. Australian body producers also kept abreast of overseas trends, introducing all steel bodies and unitary constructed bodies shortly after their overseas release. Australian designers also developed new designs, the coupé utility and all-enclosed coupé being the most successful.

The maturity of Holden's body designers, stylists and engineers placed them in an ideal position to pitch to their now parent company, GM Corporation the idea of an all-Australian car. The local design team, with fifteen to twenty years' expertise each, enabled them to complete the task and left alone, with sufficient capital, were capable of completing a new car design. It is conjecture that their result would have had the same success as the 48-215 Holden, however, in a car-starved post-war market just about anything sold.

The 48-215 Holden was a triumph, it proved GM knew what the Australian market needed in the way of design. Part of this success was the Australian design input, until now ignored and dismissed by historians. The Australian design team, with its roots traceable to 1923 in the Holden design drafting office, provided a valuable design input in the form of body structure, packaging, sealing, noise, trim development and local requirements. It took Holden 50 years to publicly recognise this effort by highlighting the careers of the three remaining and previously faceless 48-215 Holden designers. This thesis has now revealed the whole team, a team that advanced to design complete Holden cars through the 1970s, training future Holden designers who would establish Holden as a world class design centre.

My argument that the 48-215 Holden Australian design content, particularly the body structure, was world class, can be illustrated through the success of the British Coach Builders Design competition. In 1949 GM-H draftsman, Ray Herring, the second Australian to enter the competition, was awarded a third prize in the low-volume car category. This was alongside Ford designer Lew Bandt's award in the same year, in the high-volume category. Ten years later one of Herring's students, Peter Nankervis, won the prestigious open category. His three-sheet drawing was deemed to be a world class body design, reflecting on GM-H practice under which Nankervis had been trained. A second future Holden designer, Phillip Zmood, was to win the same award two years later.³

The training of coach builders, motor body builders, motor body layout draftsmen and stylists can be traced from the du Pont Paris school of drafting, through the Working Men's College and local automobile producers to the current RMIT University automotive design courses.

This thesis also explores the notion that Australian automobile historiography has generally been in the realm of non-academics, enthusiasts and journalists, much of it prone to erroneous sources or at best coloured by biographers' keen to enhance their place in history. The journey to 1953 is just the start of Australia's automotive design history. The story of the industry's development to 2017 has yet to be told; that the design accomplishment will live beyond the manufacturing era provides an excellent reason to pursue this history.

My initial adoption of Adrian Forty's definition of successful design, that what an object looks like and the instructions (drawings, sketches) to make it are critical to its success, served the purpose of identifying Australia's early automotive designers like Tarrant, Thomson, Certain, Sutton and Austin. It proved less useful in describing early automotive design practice which was dominated by invention, particularly technological invention such as Michell's work on bearings, Hoskins's steel development, Caldwell's four-wheel drive system and the myriad tinkerers who produced simple early automobiles. My research suggests that Forty's definition as applied to automobiles should be expanded to include those inventions like engines, transmissions and suspension systems because whether produced by a set of drawings and instructions or by tinkering and invention, the outcome was a designed object. In Australia, the introduction of art and craft into automobile development occurred around 1910 when craftsmen body builders (smoothers) blended and smoothed panels throughout the automobile body. By 1920 drawings emerge depicting style and a further ten years reveals the stylist working in Australia's

larger engineering offices. The transformation of smoothers to stylists was evolutionary, guided and influenced by consumer markets. Simcoe suggests the designer's job is to take engineering compromises and create an attractive design to reward the customer.² At each step, design was in play leading to my conclusion a smoother is as much a designer as a stylist. Similarly, the tinkerer who made patterns, cast and machined metal and then assembled a working engine, transmission or suspension also created a design and can also be considered a designer.

Using this point of view, an automobile designer is a creator of a practical self-propelled vehicle or component thereof, in the form of a concept, a drawing or a working machine.

It is clear research is still needed in areas of Australian automotive design. In the period 1937 to 1948, in response to a government initiative, several companies and individuals responded. Appendix I briefly discusses these designs, though the full story of their achievements remains largely untold.

Endnotes

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Appendix 1: Automobiles designed in Australia 1895-1953

It is difficult to determine the number of early Australian motor cars produced up to 1953. In 1974 Max Gregory identified 22 pre-1948 vehicles without references but he did acknowledge six people who provided him with data associated with the vehicles.¹ In 1976 Gregory updated his list, recording a further eight names.² In 1982, 11 more vehicles were identified without referencing.³ In these three articles some reproduction of images and advertisements provide a clue to the sources used.

A list of 57 Australian makes appeared in 1975 with the publication of the *Second James Flood Book of Early Motoring*, no references are provided except for illustrations from catalogues and journals of the period.⁴ In 1979 Pedr Davis included 31 names in *Australians on the Road*, again without references or source material.⁵ Terry and Marie Gilltrap, *Australian Cars from 1879* (1981) list 82 names, many have no source and were possibly never made.⁶ A number of the Gilltrap entries have been shown to be rebadged imported cars or rebuilt from other makes, some are repeated under different names. Tony Davis updated his father's list in *Aussie Cars* (1987) documented 89 pre-1953 vehicles.⁷ In the same year George Brooks and Ivan Hoffmann produced a survey of South Australian cars.⁸ Their list was based on SA registrations and the names of cars registered. This has led to 104 different car names, many are duplicates, misspellings, re-bodied vehicles and personal names of the person registering the vehicle. Of interest are four electric cars previously unlisted and details on several known names that previously lacked documentation. Brooks and Hoffmann add a further 16 cars to the list of Australian made vehicles.

The Gilltraps also wrote an article identifying five cars that were based on imported components, engines, transmissions and axles.⁹ These five cars have long been accepted as Australian cars but the majority of content was assembly with a local body. There have been individual articles written on selected Australian cars in both magazines and books but none provide any referencing.¹⁰ Recently, Frank Rodwell's *I like old cars (2015)* listed 166 Australian car names, some are doubled up and some are previously unknown and will require additional research to prove their existence and provenance.¹¹

The Brooks, Hoffmann and Rodwell lists and my research show that there are still cars to be found. The assembled cars, Summit, Australian Six, Eco, Besst and Lincoln are dealt with separately along with the Roo, Chic, Caldwell-Vale, Wege, Southern Cross and Marks-Moir in Chapter 5.

Combined totals of Davis, Gilltrap, Flood and Brooks/Hoffmann number 122, add 13 identified during this research equals 135. At least five have no credible reference documenting their existence, a further seven were rebadged or locally bodied imported vehicles. Some 74 are identified as personal endeavours with no intent to market, leaving just 49 vehicles that can be claimed to be either planned for production or marketed. A chart below records the 105 vehicles I have determined have Australian design content.

Some of the imposters and individual efforts are discussed in the interests of establishing their classification. The criteria used for being recognised as an Australian designed car is determined by the vehicle having been produced largely in Australia and using local designed and or locally made components.

Australian built automobiles with local design content

Name	Designer	Year	Page	Name	Designer	Year	Page
AAM*	W Holstock	1929	315	Cadillac Spl	D, C & L Head	1949	328
Albani Six*	H Scott-Young	1922	316	Caldwell*	Norman Caldwell	1913	76
AMSCOL*	Hannan Bros	1927	321	Campbell	Arch Campbell	1900	⁸⁹
Auscar*	George Bateup	1938	245	Carter*	Harold Carter	1920	315
Austral*	W E Noble	1913	312	Cattermole	John Cattermole	1904	310
Australian Six*	F H Gordon	1919	128	Certain	Marcel Certain	1897	34
Australis*	George Wood	1900	37 305	Chamberlain*	Bob Chamberlain	1938	243
Autocar	Henry Sutton	1896	66	Chic*	Clarence Chic	1923	142
Barossa Pride	G Kaesler	1921	312	Craine*	T C Craine	1908	312
Beauchamp	Charles Mayman	1904	72	Davis	R Davis	1902	307
Peoples Car*	Bassin	1950	325	Davis-Franklin	M Franklin	1901	41
Besst*	George May	1919	142	Die Casters*	Roy Newton	1935	247
Both*	Thomas Both	1940	321	Earle	Stan Earle	1912	⁹⁰
Bowker*	John Bowker	1940	323	Earnshaw	C Earnshaw	1905	310
Buckingham*	J Buckingham	1933	316	Eco*	Hamilton-Grapes	1919	139
Bullock	John Bullock	1902	306	Edwards	TCA Magavey	1910	⁹¹
Burton	William Burton	1898	41	Egan*	William Egan	1935	316

Australian built cars with local design content

Name	Designer	Year	Page	Name	Designer	Year	Page
Ekins	A L G Ekins	1909	⁹²	Peoples Car*	J Buckingham	1947	325
Eley	Eley Bros	1907	310	Peoples Car*	unknown	1947	327
Elliott	F C Elliott	1906	⁹³	Phizackerley	I Phizackerley	1902	307
Finlayson*	Finlayson Bros	1900	305	Phoenix	Phoenix Foundry	1873	44
FRM-Lossel*	Stephen Fischer	1938	317	Pioneer*	Henry Austin	1897	30
Flinders*	E Swiggs	1914	⁹⁴	Reville Ranger*	Jean Reville	1950	327
Grayson	John Grayson	1906	311	Richter	Chris Richter	1903	307
Hains & Grut*	P J Grut	1908	312	Roo*	Bill Foulis	1918	135
Hammer	Bruno Hammer	1905	⁹⁵	Shearer	David Shearer	1897	42
Hannan*	Hannan Bros	1931	321	Shields*	L Shields	1933	316
HARCLI	Harold Clisby	1928	314	Southern Cross*	James Marks	1930	137
Hartnett*	L J Hartnett	1949	287	Southcott	Alfred Southcott	1905	⁹⁸
Hawker	Harry Hawker	1900	⁹⁶	Southern Six*	Cyril Maddocks	1922	317
Highland	Charles Highland	1897	37, 305	Stormon*	James Stormonth	1928	137
Holden	Roy Holden	1911	313	Summit*	William Kelly	1923	132
Hoskins	G J Hoskins	1915	78	Sutton (Autocar)	Henry Sutton	1896	66
Humble*	Humble & Sons	1904	308	Swinerton	Alfred Swinerton	1907	309 313
JB Minor*	Jeffress Brothers	1949	325	Syme	Syme	1903	307
Jessop	Cecil Jessop	1906	311	Tarrant*	Harley Tarrant	1901	55
Laird	Campbell Laird	1906	44	Taylor	Hylar-White	1906	74 311
Lean	Richard Lean	1903	308	Thomson*	Jack Thomson	1937	248
Leckie	Arthur Leckie	1901	41 306	Thomson*	Herbert Thomson	1898	45
Lewis*	Tom O'Grady	1900	42 72	Till	William Till	1906	312
Lincoln*	Charles Innes	1918	126	Tillbrook	R P Tillbrook	1953	327
Macque*	Allan Macqueen	1913	313	Toy	William Toy	1905	⁹⁹
Malpas	Leonard Malpas	1913	314	Trackson	James Trackson	1901	306
Malpas	H G Malpas	1914	⁹⁷	Trescowthick	C Trescowthick	1904	309
Marks-Moir*	Jim Marks	1923	136	Trevethan	Walter Trevethan	1904	308
Marriott	James Marriott	1903	308	Tucker	Richard Tucker	1897	35
Mayman	Charles Mayman	1904	73	Victory*	Keep Bros, Wood	1913	315
MCM*	Jim McMahon	1945	324	Way	William Way	1904	74 310
Modistach	Fred Modistach	1904	309	Wege*	William Wege	1921	144
Moore	Raymond Moore	1940	233	White*	Dan White	1903	97
Ohlmeyer	Albert Olmeyer	1904	309	Wiles*	Jack Thomson	1949	248
Pender*	John Pender	1897	35	Zeigler	Johann Zeigler	1898	41
Pengana*	William White	1937	243	Williamson	TP Williamson	1908	312

NOTE:

Cars named in bold discovered during this research.

Cars shown in italics were planned, with some design activity but there is no evidence of them ever being produced.

An * indicates car planned to be marketed.

If no page number indicated see reference number.

A Catalogue of Australian cars 1895 - 1939

Fig. AI.1
1896-1897 Charles Highland
1-cylinder Quadricycle, Sydney.¹²
Mitchell Library Qld

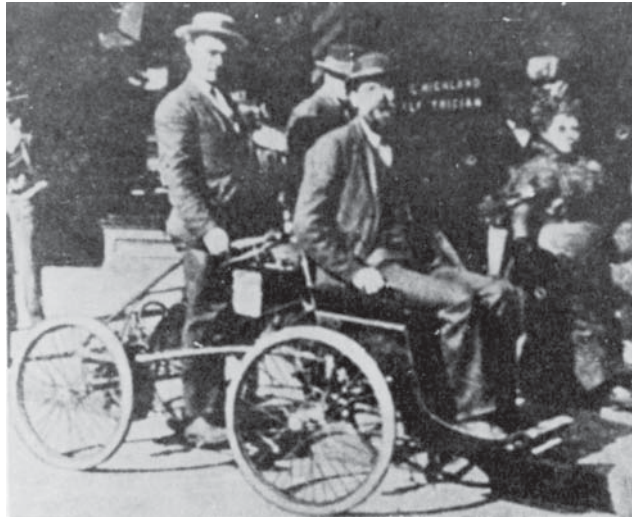


Fig. AI.2
1900 Finlayson brothers 2-cylinder.
Devonport.¹³
H Paynting Collection - SLV

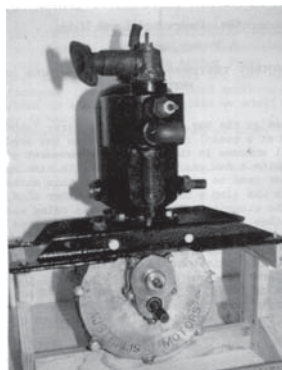
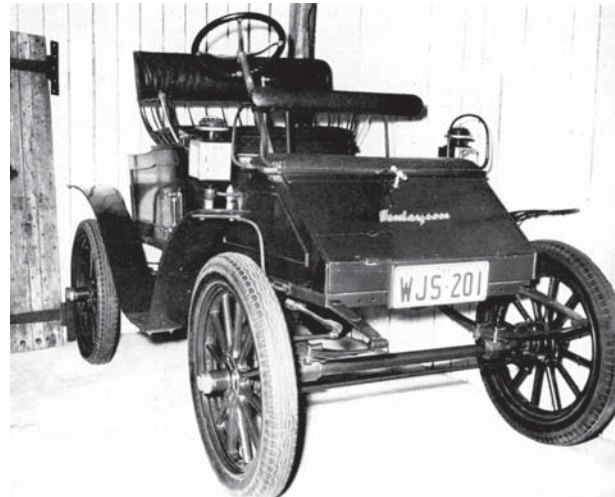


Fig. AI.3
1901 George Wood Australis car and
1-cylinder engine.¹⁴
VCCC Brass Notes

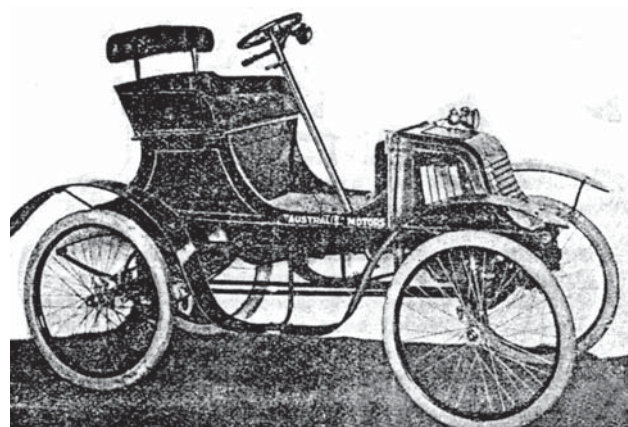




Fig. AI.4
 1901 Bullock Quad Adelaide.¹⁵
State Library of SA



Fig. AI.5
 1901 Arthur Leckie Ballarat.¹⁶
Neil Leckie



Fig. AI.6
 1901 James Trackson 5hp cycle car
 Brisbane.¹⁷
State Library of Qld

Fig. AI.7 Davis Car Kent Town SA.¹⁸
SA Sporting Car Club

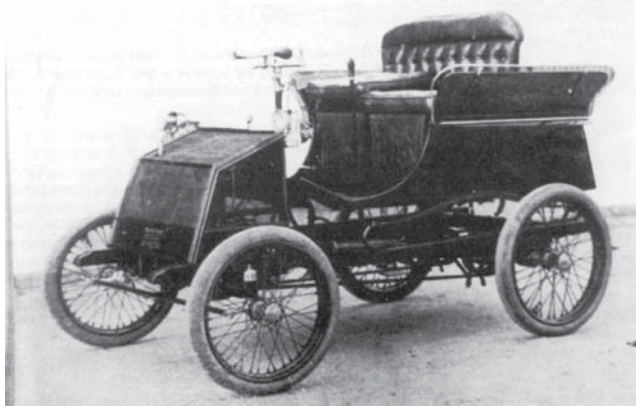


Fig. AI.8
1903 Isaac Phizackerley Sydney.¹⁹
Mitchell Library

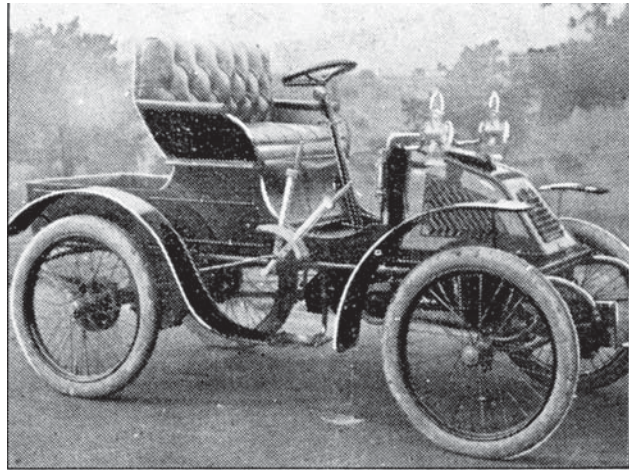


Fig. AI.9
Richter cycle car Hawthorn.²⁰
H Paynting Collection - SLV



Fig. AI.10
Syme 1-cylinder car Fitzroy.²¹
State Library of NSW

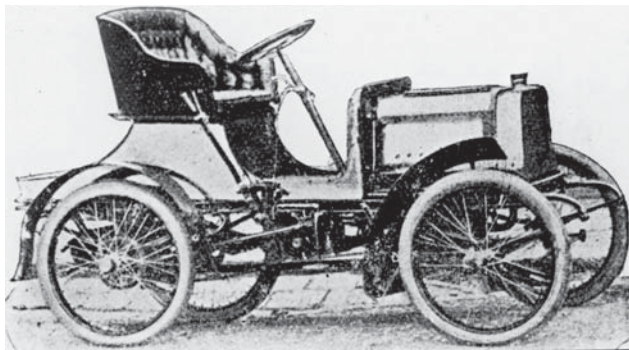


Fig. AI.11
1903 Lean.²²
John Oxley Library



Fig. AI.12
1903 Humble.²³
H Paynting Collection - SLV



Fig. AI.13
1903 Marriott Melbourne.²⁴
H Paynting Collection - SLV

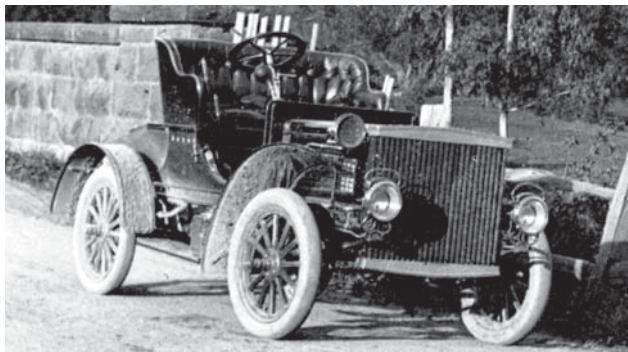
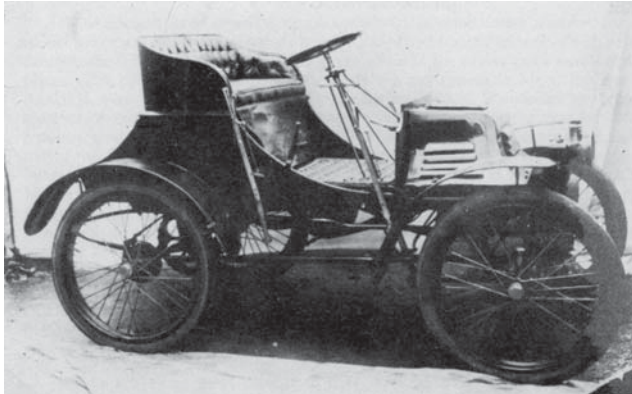


Fig. AI.14
1904 Trevethan Brisbane.²⁵
RACQ

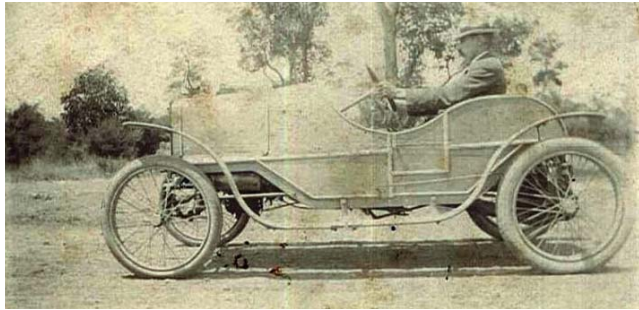


Fig. AI.15
1904 C H Trescowthick Adelaide.²⁶



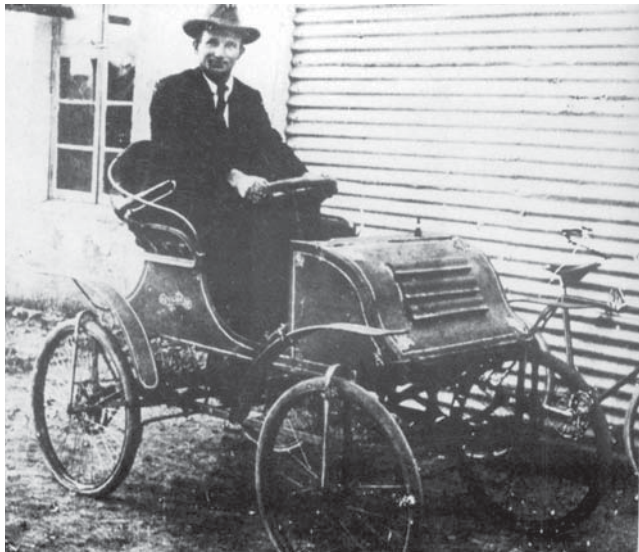
S Burgess

Fig. AI.16
1907 Swinnerton Sydney.²⁷



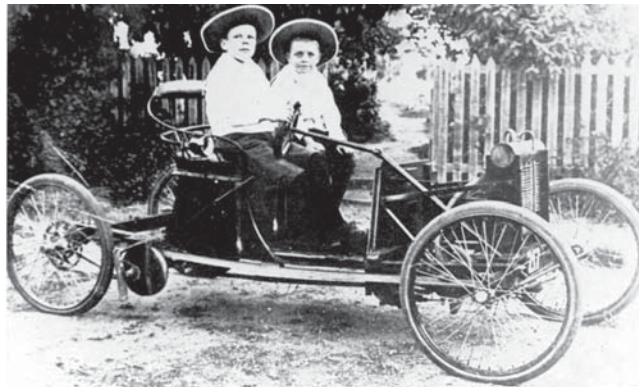
RACQ

Fig. AI.17
Modistach cycle car.²⁸



SA Sporting Car Club

Fig. AI.18
Ohlmeyer jigger Mt Torrens SA.²⁹



State Library of SA



Fig. AI.19
1904 Cattermole Adelaide.³⁰
SA Sporting Car Club

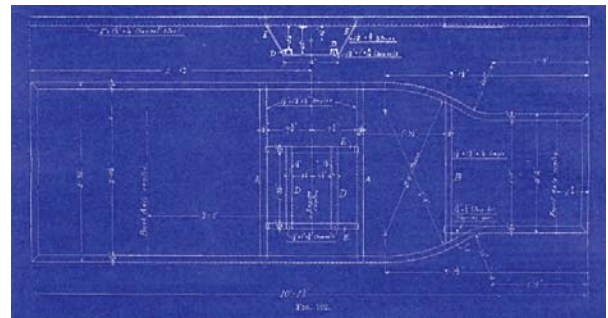
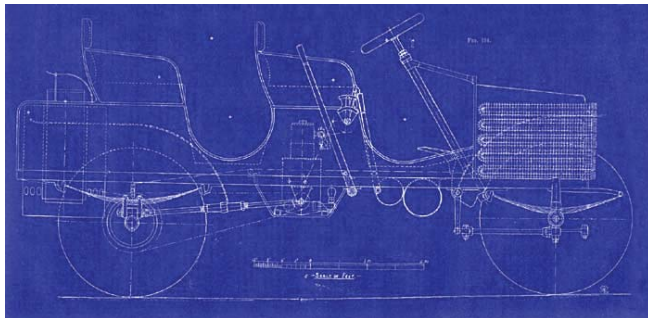


Fig. AI.20
T Hyler White drawings as produced from the *English Mechanic* and reproduced in *Serpolette's Tricycle*.³¹
Serpolette's Tricycle September 2012, 20

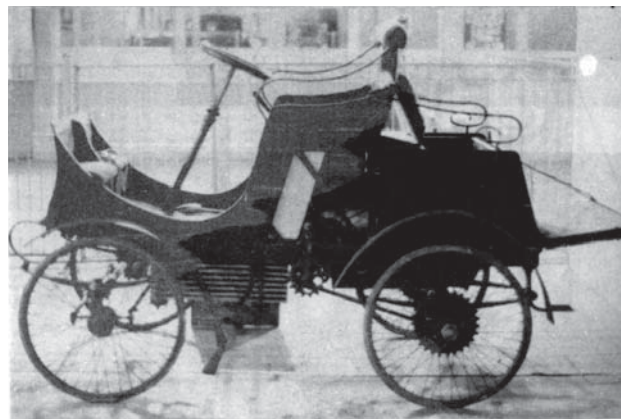


Fig. AI.21
The Eley brothers car as it appeared in the *English Mechanic* in 1907.³²
Serpolette's Tricycle September 2012, 19-20

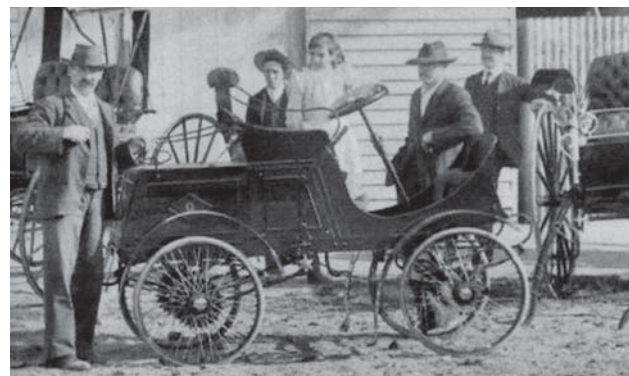


Fig. AI.22
Hyler White designed car built by William Way in Bombala NSW.³³
David Goodyear - Bombala Newsagency
VCCC Brass Notes

Fig. AI.23
Hyler White designed car built by F
A Taylor.³⁴

VCCC Brass Notes

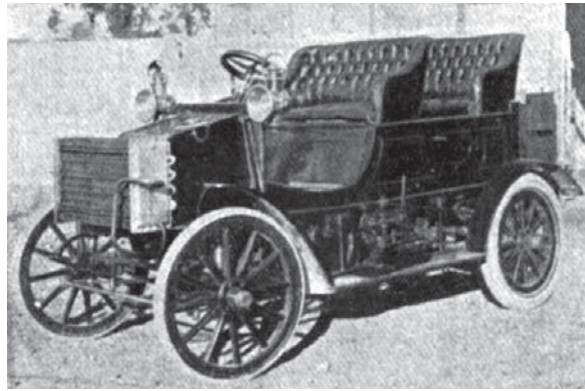


Fig. AI.24
The Earnshaw car with Captain
Charles Earnshaw's family, the
chassis and patterns of the engine.³⁵

Echuca Museum

Fig. AI.25
1906 Grayson Melbourne.³⁶

The Australian Motorist

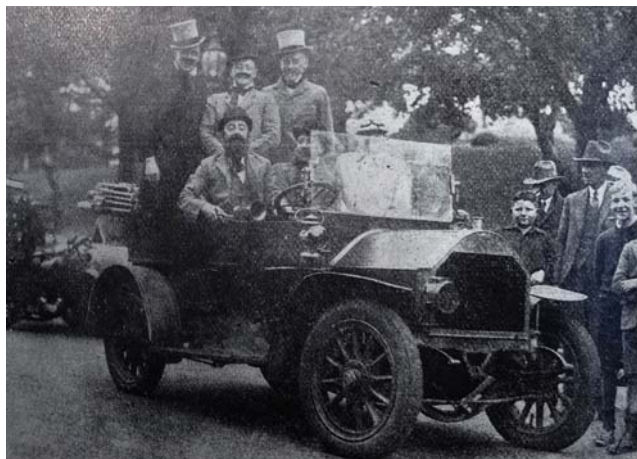


Fig. AI.26
1906 Jessop Tasmania.³⁷

SLV



Fig. AI.27
Craine Car Melbourne.³⁸
State Library of NSW

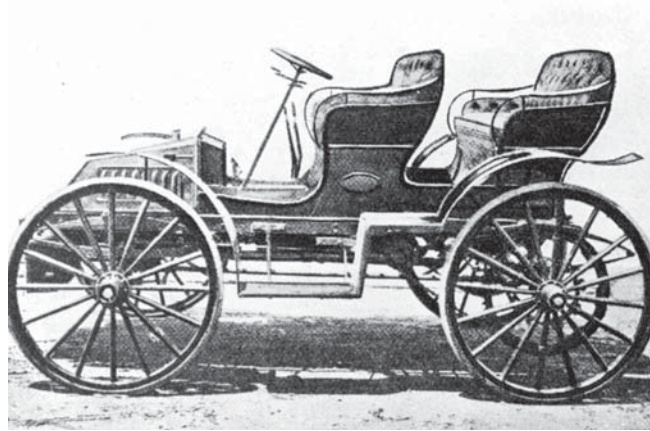


Fig. AI.28
1906 Till car Melbourne.³⁹
HH Paynting

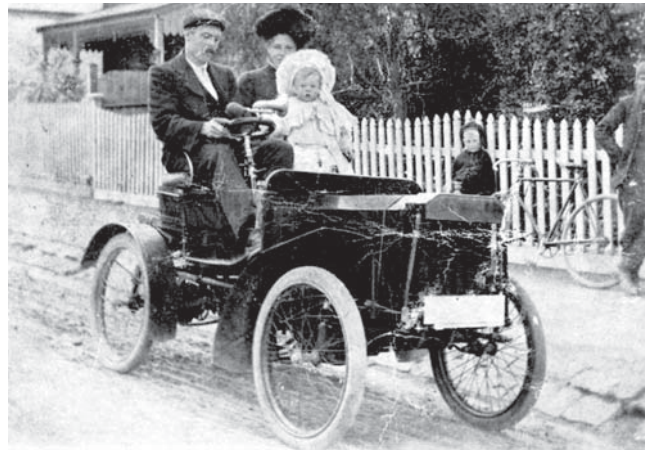


Fig. AI.29
Williamson's carriage Yass,
NSW.⁴⁰
Mitchell Library



Fig. AI.30
1908/09 Haines & Grut Buggy
Melbourne.⁴¹
SLV



Fig. AI.31
1913 Macque Cycle Car Melbourne.⁴²
Gilltrap

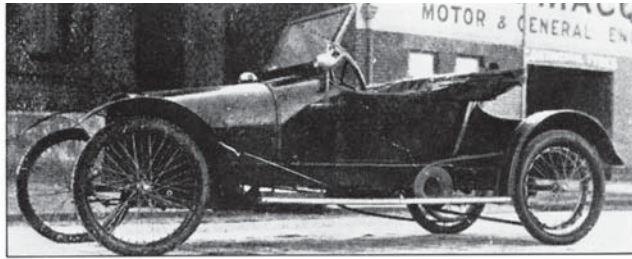


Fig. AI.32
1913-1914 Austral Cycle Car
Melbourne.⁴³
Bill Sides



Fig. AI.33
The Barossa Pride big and small,
both built by G C Kaester SA.⁴⁴
The Mail (Adelaide)

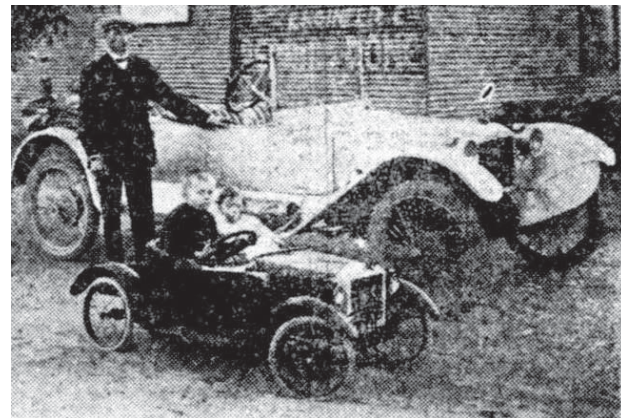


Fig. AI.34
1915 Swinnerton Sydney.⁴⁵
RACQ

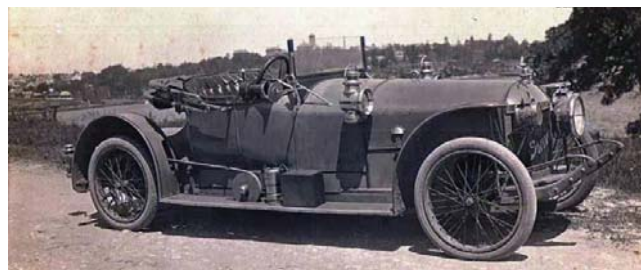
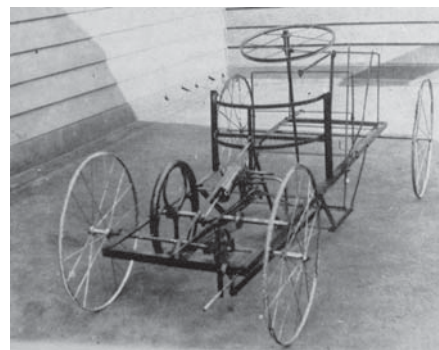


Fig. AI.35
1911 Roy Holden of Geelong car.⁴⁶
N Darwin Collection



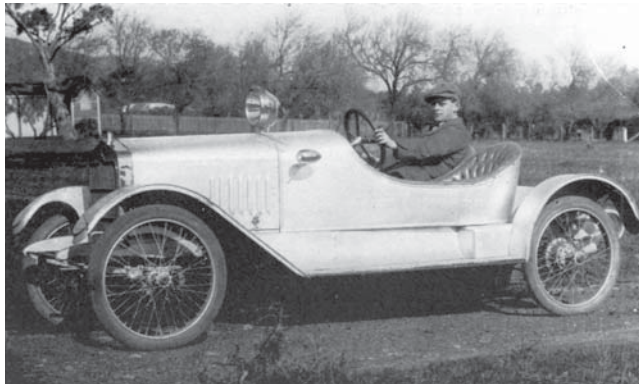


Fig. AI.36
Malpas and Stace car Adelaide.⁴⁷
SA Sporting Car Club

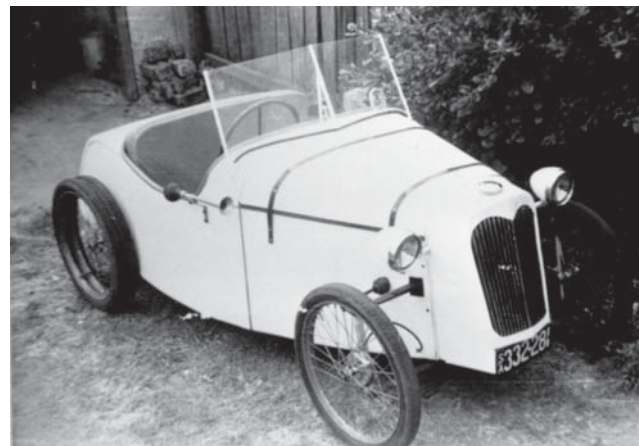
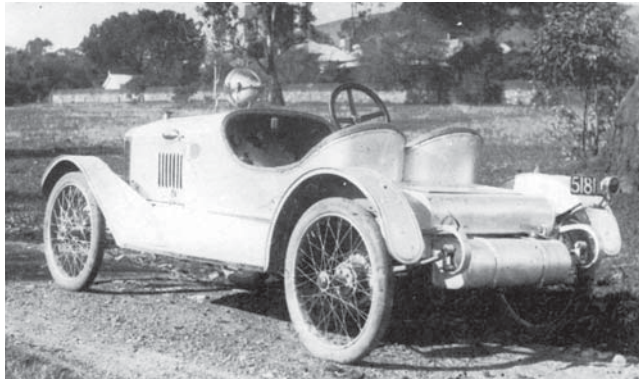


Fig. AI.37
Clisby's cycle car named from his
initials, HARold CLIsby.⁴⁸

Ivan Hoffmann

Manufacturing attempts

In addition to the attempts at serious Australian car manufacture covered in Chapter 5 were the efforts of AAMA, Keep Brothers and Wood, Cyril Mattocks, Hugh Scott-Young, William Egan and Les Shields. A very early attempt in 1909, by A J Cotton in Brisbane, Queensland, to manufacture a tractor like vehicle, was patented and a prototype planned to be built in England. Nothing further happened.

The Keep Bros & Wood had conducted a coach building business in Melbourne since 1899 and from 1913 a motor trade house supplying all manner of accessories and parts. In 1915 they took an agency for the Trumbull car and early the following year announced the Anzac touring car. The engine, chassis and mechanicals were fully imported with only assembly and a Keep Bros & Wood body being local. Barnes Gear steering and Ward Electrics were two of the overseas suppliers for a car weighing 16cwt and on sale at £285. Few appear to have been built and the firm ran into problems over the name Anzac, being forced to change it to Victory in June 1916.⁵⁰ (Fig. AI.38)

A largely unknown Australian car was the Carter. Harold Carter built up to seven cars from 1916 through 1923. He put two vehicles on show at the 1920 Adelaide Motor Show that were well received by the *Australian Motorist*. The 2-seater roadster was reported to have only an imported engine accessories and transmission. The engine was recorded as being an 11.9hp 4-cylinder monoblock with 69mm bore and 102mm stroke. The second car, from the description, appears to have more imported parts.⁵¹ (Fig. AI.39) Carter also built stationary engines branded “C Carter, Maker Unley”. He did not appear to have a factory, building cars at his residence. His son, Robert, suggests his father could visually size up a part in a scrap yard, knowing just how he would use it.⁵² Carter was born in 1889 with automobile blood in his veins, his mother’s cousin was Charles Nash (Buick, GM President, Nash cars) and perhaps a connection to the Carters of Rutland Engineering in the UK who produced the Blackstone stationary engine. Carter began building cars after moving from the family farm at Templers (North of Gawler) to Adelaide in 1916.⁵³

In 1929, under the direction of W Holstock, the Australian Automotive Manufacturers’ Association (AAMA) built a prototype car chassis with as many locally made parts as could be purchased from members. The rolling chassis, with a Chevrolet 4-cylinder engine and transmission was displayed at the 1929 Royal Melbourne Agricultural Show with several

buyers expressing an interest. (Fig. AI.40) The AAMA was formed in July 1929 by Australia's leading auto parts manufacturers with Stan H Earle elected president. A car committee planned to highlight the range and quality of Australian manufactured parts including a future engine and transmission by building and selling their own car. Holstock & Jamieson made the fenders and valance panels and possibly the body that was fitted later. Mechanic, C H Parker, was involved with the Albani car in 1922. The depression ended this progressive endeavour.⁵⁴ The State Library of Victoria has an image of an Albani Six motor car (also referred to as an Albany) built by the Albani Motor Construction Pty Ltd, registered on 10 March 1922 by manufacturing agent Hugh Scott-Young and textile mechanic Charles Parker. Thought to have been assembled using an imported 25hp engine, little else is known other than the company advertising for agents to sell the car.⁵⁵ (Fig. AI.41)

The Buckingham was conceived by John Buckingham who controlled a garage in Mildura (1920) and then Footscray (1926) with Edward Edwards. By 1929, together with a new partner, A T Ward, plans for an automobile, the Hamond, were underway. Buckingham registered Hamond Motors in Footscray in 1933. Almost immediately the name changed to Buckingham. A specification based on a locally made 21.7hp 4-cylinder engine was underway with a prototype being displayed at the 1933 Melbourne Motor Show.⁵⁶ Both a 4-door 60 sedan and a 2-door 75 Coupé were being proposed for production with a tourer and roadster model to follow. (Fig. AI.42 and AI.43) A commercial version, the Ward truck, was also promoted. Buckingham and Ward purchased the engineering firm of Humble & Sons of Geelong to facilitate production, yet only a few vehicles were sold. Parts for the Buckingham and Ward vehicles were made by H V McKay (castings), Mephram Ferguson (chassis), A T Richardson (steering, differential and gearbox) and Henderson Springs (springs and brakes). A report in March 1934 suggested production at Geelong was imminent. This was the last to be heard of the Buckingham and Ward vehicles.⁵⁷ When the venture failed to attract sufficient capital Buckingham & Ward reverted to repairs, though in 1947 Buckingham did surface as part of a Peoples Car project. (See page 342) Buckingham launched a plan to import 400 Toyota cars and trucks in 1947.⁵⁸

In 1935 William Egan, a Geelong motor body builder, embarked on the local production of a 4-door sedan. Using an imported 6-cylinder Lycoming 22.5hp engine, transmission axle and brakes, Egan built a cruciform

chassis and the body. The balance of components, radiator, battery, springs, shock absorbers were produced locally. Egan built two prototypes, showing the first at the 1935 Melbourne Motor Show. He then made several improvements, pricing the car at £420 and took several orders; unfortunately, he failed to complete these vehicles.⁵⁹ (Fig. AI.44)

A single Shields sports car was shown at the 1933 Melbourne Motor Show. The vehicle was fitted with an 18hp 6-cylinder engine coupled to a front wheel drive transmission/differential. The prototype was produced by Phoenix Motors Pty Ltd of High Street, St Kilda and designed by Les Shields who had been working on his design since 1929. The vehicle utilised a 18.15hp 6-cylinder engine, 112-inch wheelbase and 3-speed transmission. (Fig. AI.45) Shields had served an apprenticeship with Tarrant Motors and gained experience in USA with Oakland and Hupmobile.⁶⁰

Late in 1921 Cyril Maddocks, Managing Director of Australian-British Cars Ltd (Perth), announced the production of the Southern Six car, based on English components: a 6-cylinder 20hp Sage engine, Wrigley transmission, spiral bevel rear axle, Sankey wheels and Brolt electricals. The proposal was for the car to be assembled locally using an Australian body. Maddocks was a friend and former partner of Sir Charles Kingsford Smith and was using the name as leverage on future sales. The price was disclosed as £750 for a 4-seater touring body. Maddocks had a prototype built in England and following testing at the Brooklands circuit shipped the vehicle home.⁶¹ After the initial announcement nothing further was heard. Maddocks died suddenly two years later. (Fig. AI.46)

Jan Lossel, a Czech, fled Prague when the Nazis annexed his country in 1938. Lossel arrived in Sydney in 1939 with his wife, daughter and a specification for a new 4-cylinder light car. In May 1939 Lossel announced he and a friend planned to build another prototype in Australia with the view to manufacture the 12hp, transverse rear engined car with swing axles, 3-speed overdrive transmission and integral streamlined body designed to seat five passengers.⁶²

The design came from Stephen Fischer, a former Czech JAWA engineer who built a working prototype along the line of a Tatraplan car, complete with Paul Jaray influenced styling. The preliminary version was tested by K Z Michl at his motorcycle factory.⁶³ The outbreak of war ended any chance of this innovative car being made in Australia. (Fig. AI.47)

Fig. AI.38
The Victory Tourer assembled by
Keep Bros. & Wood.⁴⁹
**The Australasian Coachbuilder &
Wheelwright, 1916 June**

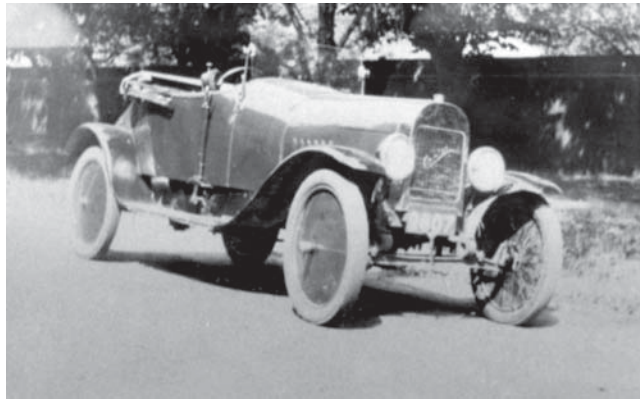


Fig. AI.39
Three Carter cars, top circa 1916
and below circa 1920. All have
professionally built bodies
suggesting Carter had them
made.⁴⁹

Roy Carter - Ivan Hoffmann

Fig. AI.40

AAMA chassis with members of the Car Committee, L to R. R G Fernie, T F O'Shannessy, W Holstock, S H Earle, S Smith, C H Parker and J Wallace.

The Australasian Coachbuilder & Wheelwright, June 1916

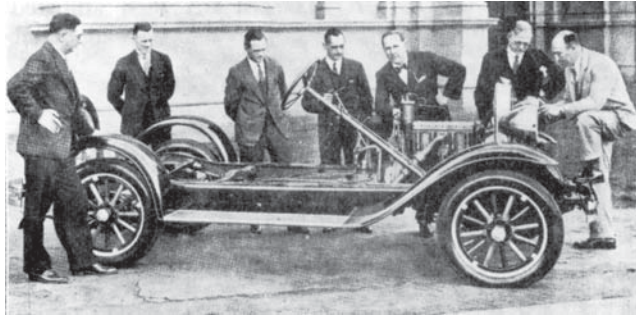


Fig. AI.41

The Albani Six. The car was initially promoted with a 5,000 mile endurance test through Victoria followed up by extensive advertising.

The Australian Motorist

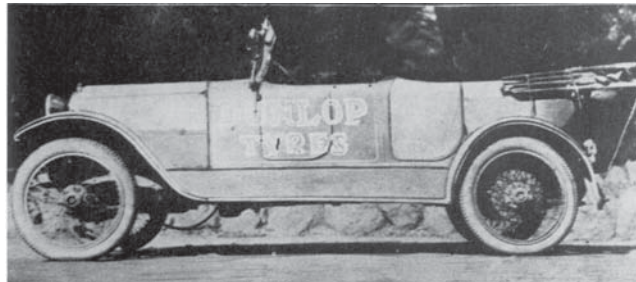


Fig. AI.42

Buckingham Coupé 75 with a body made by Egan Body Works Geelong, priced at £245.

The Coach & Motor Body Builder

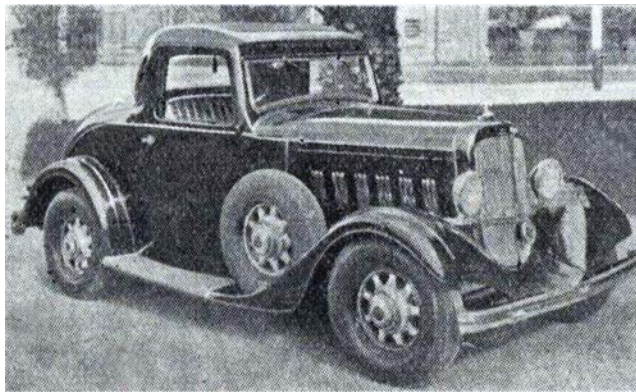


Fig. AI.43

Buckingham 60 Sedan with body made by the Elite Motor Body Works, priced at £295.

Buckingham prospectus

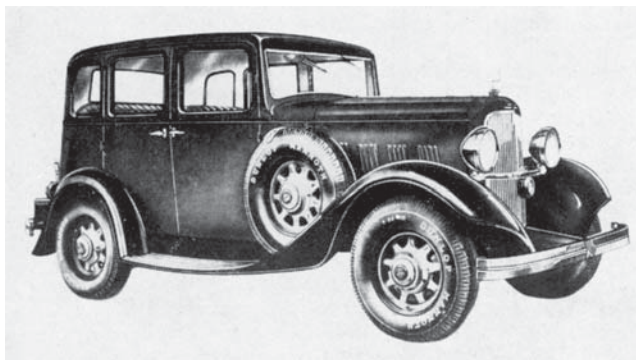




Fig. AI.44
The Egan Sedan.
HH Paynting Collection - SLV

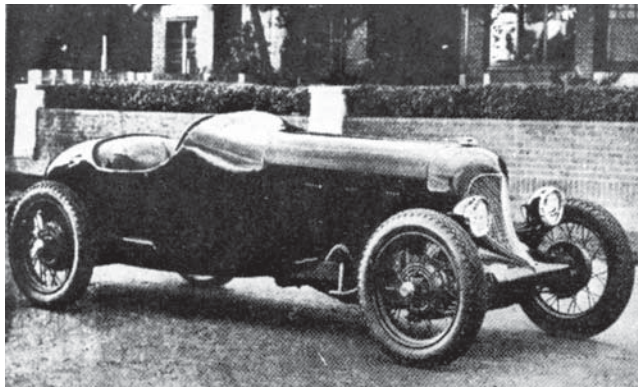
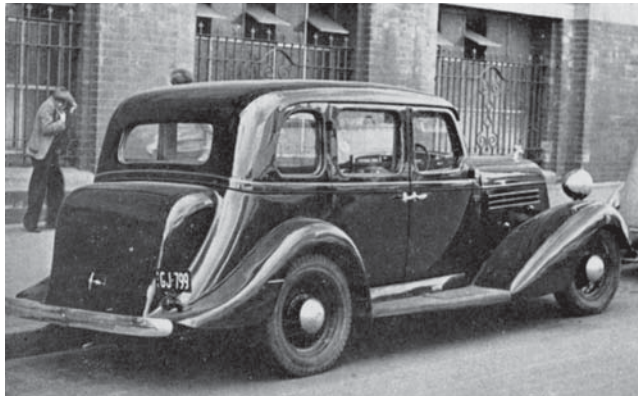


Fig. AI.45
Shields front wheel drive car.
The Australian Automobile Trade Journal, July 1933.

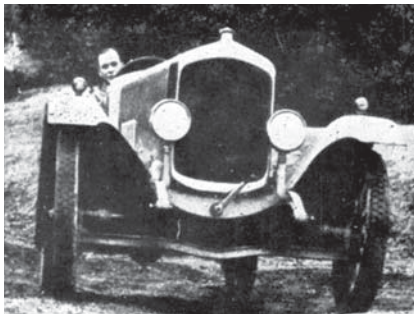


Fig. AI.46
The Southern Six.
The Australian Motorist

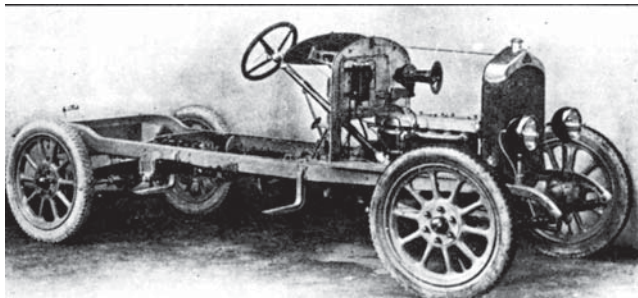
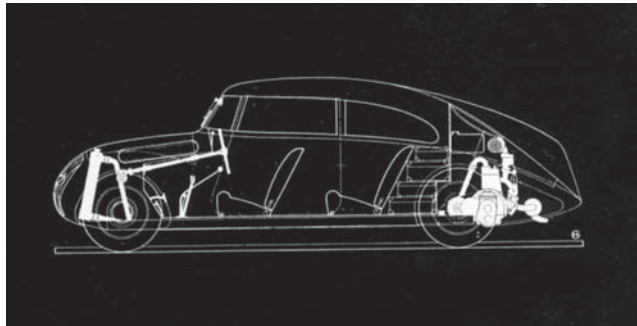
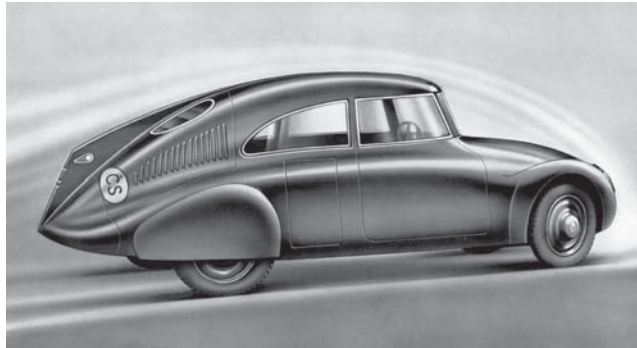


Fig. AI.47
Proposed Lossel-FRM rear-
engined car.
FRM Specification-Plans folder



Electric cars

Three electric cars have been identified by Brooks and Hoffmann, the Hannan Brothers building at least two electric vehicles: a milk delivery truck on an American chassis in 1931, registered as an Amscol Electric after the dairy and in 1927 a Lucas promotional vehicle on a Ford chassis.⁶⁴ (Fig. AI.48) The Bowker car featured some innovative design including a propeller to re-charge the battery under head-wind conditions. The propeller, as were the other novel ideas, was developed by Lyle Eves who reasoned a head-wind would overdrive the propeller and counteract any normal resistance and extra power consumption.⁶⁵ Developed by John Bowker and W J Cowell during 1940-1942, the two experimental Bowker cars were driven extensively with Bowker claiming a range of 100 miles at 30mph. Cowell grew up in Melbourne becoming an authority on X-ray technology but changed direction when petrol was rationed, embarking on the development of an electric vehicle. A Ballarat electrical engineer, Eves, built the electrical components and retired bodybuilder, George Boetecher, made the body on a cobbled-up chassis utilising second hand parts in Bowker's garage in Linden Park, SA. Colwell financed the development and succeeded in gaining publicity and interest from Canberra. Bowker did not



Fig. AI.49 Above. Bowker electric car. **The Sporting Car Club of SA**



Fig. AI.47 Left. Hannan 1927 promotional electric car.

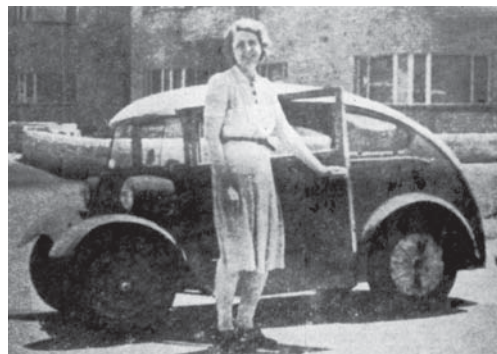
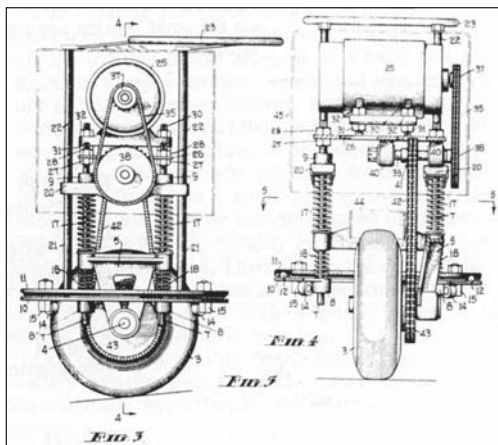
The Sporting Car Club of SA

Fig. AI.50 Left. Both 3-wheel van.

The Sporting Car Club of SA

Above. Both van patent.

Aust. Patents office



get his electric car off the ground and was still developing the concept at his Carnegie, Victoria, workshop in 1974, using a revolutionary Bowker Power Cell.⁶⁶ (Fig. AI.49)

In March 1940 Edward Thomas Both patented a 3-wheeled electric van as a means to conserve petrol during the war. Built at Okes & Both Electrics Ltd workshop in Adelaide, the van used a single front wheel combining the motor and suspension in a single unit. In 1941 Both outsourced the bodies to J A Lawton and Son of Adelaide, who also fitted a windscreen, bumpers and doors.⁶⁷ (Fig. AI.50)

Both was considered Australia's Edison, inventing the first electronic scoreboard for the Davis Cup in 1952, a portable electrocardiograph in 1932 and various war projects including the Vislter, an early form of fax machine. Both was awarded an OBE for work on developing a lightweight portable Iron Lung made from wood during the 1937-1938 poliomyelitis epidemic. Lord Nuffield financed the production of 1,700 of Both's machines in his Morris car factory in 1938-1939.⁶⁸

Automobiles misidentified as Australian

A number of individuals have been listed in the published works as giving the impression that they were producing a local car but, in reality, it was an overseas make rebadged. Gilltrap suggests at least one B & B car was built in Sydney in 1913.⁶⁹ The car was powered by a Chater-Lea engine and transmission and this suggests it was, in actual fact, a Chater-Lea cycle car. There is a record of a Chater-Lea car being shown in Adelaide in 1913. Gilltrap also lists the Carbine which was, in effect, a French car with a De Dion-Bouton engine and a Clements, which was built using motor bike parts. A further listing under Alfred Cotton is for a car manufactured in England and from descriptions it was more tractor than car.⁷⁰ Gilltrap records that F B Puckridge of Port Lincoln, SA, built a car from an existing trike owned by Dr E Kinmont of Port Lincoln. When the three-wheel Motor Manufacturing Company trike capsized on Dr Kinmont, he asked Puckridge to transform it into a 4-wheeler.⁷¹ Puckridge later claimed to have designed and built a 2-speed transmission for the vehicle using gears cut by J H Southcott of Adelaide.

A number of motor agencies also attempted to give the appearance that they were selling an Australian designed and built car. George Innes of

Sydney is said to have purchased Madam Serpollette's gladiator motorbike in 1897 and built his own engine the same year. An early Sydney motor agent, Innes sold Winton cars from 1901. In 1904 he advertised both 1 and 4-cylinder Innes cars but these were actually Panhards with De Dion-Bouton engines. Innes contracted the Panhard Company to supply the chassis and De Dion-Bouton engine. George Innes was later, in 1919, said to have been involved in the Lincoln car project through his son.⁷² This is incorrect as this Innes, Charles, emigrated alone in 1908 as a 25-year-old. E W Brown Motors Pty Ltd were more blatant, importing T Model Ford parts outside of the Ford distribution network and adding the Palm (1919) and then Renown (1923) badge. Spark motors produced a rebadged T model, the Spark, at the same time, selling few.⁷³

The Knowles Automobile & Motor Power Co Ltd of Sydney and Melbourne were early automobile agents who advertised the Knowles Aster and Knowles Simplex motor cars in 1903. The Aster was made in Paris by the Aster Engineering Company and the Simplex cars were built by Darracq. Knowles cars were simply re-badged.⁷⁴ Knowles gained the Darracq agency in 1904.

Anders Nielsen of Rockhampton, Queensland, an emigrant coachbuilder, had arrived in Australia in 1873. After working for various firms he established a business around 1904, that in 1905 advertised it would design, to order, motor cars. An advertisement shows a quadricycle car that bears a close likeness to the American Locomobile of the time. A show report for 1904 indicates Nielsen had a horseless carriage and two horse drawn vehicles in an agricultural show.⁷⁵

The Hoskin car has been listed as an Australian vehicle, in truth it was an English Standard touring car with a front wheel drive system patented by George John Hoskins (1847-1926), who invented a "spherical radial gear" system in 1915.⁷⁶ (see chapter 2)

Post WWII proposals

Following WWII three stillborn proposals surfaced. Queensland speedway driver, James (Jim) McMahon (1912-1947), constructed a prototype MCM aluminium sports car in 1944 fitted with a 600cc DKW 2-stroke engine. McMahon then designed his own 2.0 litre engine using a crankshaft from a Ford V8 and cylinders from a Twin Triumph motor cycle. The engine was

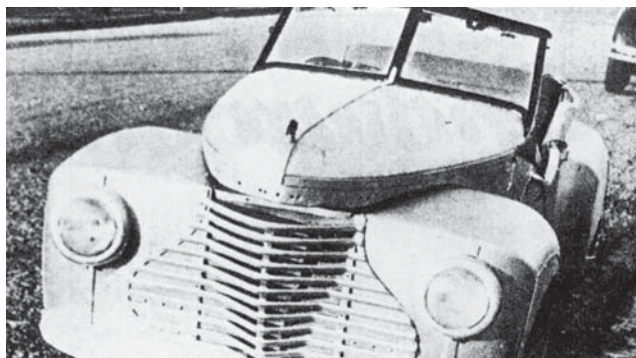
fitted to a Kurtis-Kraft speed car by McMahon and raced at the Carpinteria ThunderDome, USA, where he was killed in an accident whilst driving.⁷⁷ (Fig. AI.51)

The JB Minor was conceived by the Jeffress Brothers of Northgate, Brisbane, as a small light 3-wheel car. Two prototypes were produced, the first with 3 wheels, front wheel drive and a single rear wheel that steered the car. A second prototype had 4 wheels and a 5hp 2-stroke engine coupled to a hydraulic rear fluid drive.⁷⁸ The steel bodies were made by local body builder, Athol Hedges, and the expected price was £250. The Jeffress brothers planned to build 40 per month in their engineering works and foundry commenced mid 1950. Owing to foundry problems, the project was shelved and eventually scrapped.⁷⁹ (Fig. AI.52)

In April 1947 J T Buckingham and J C Dillon, two men involved with past attempts at Australian car manufacture, registered The People's Car (Australia) Ltd. Directors also included R C Dyer (grazier), J Aitken (builder), K Pickford (grazier) and A E Boquest (wholesale butcher).⁸⁰ It is unclear if this effort was connected directly to the White/Pengana car (see chapter 8), although some activity appears to have been made since Archibald McIntyre of Horsham was in possession of a photograph, taken by the local paper, of a 4-cylinder block casting with *The Peoples Car Made in Australia* cast in the side. (Fig. AI.53) McIntyre, who worked at May and Millar's foundry, was present when four men associated with the car company arrived and asked him: "will you burn the thing and stop the motor [production], we don't want a car made in Australia".⁸¹ McIntyre was upset as the castings they had made were fed back into the furnace and destroyed. McIntyre believed the company making the engine had American finance, though he could not recall the company name. McIntyre thought the car would be made in Sydney and recalled the foundry working on other components that were then being fitted to a chassis on site. The Peoples Car (Australia) Ltd also planned to manufacture aeroplanes, seaplanes, motor cycles and bicycles. The Peoples Car (Australia) Ltd and Buckingham were last in the news in 1949 seeking an import licence for Japanese cars and trucks.⁸²

In January 1950 a second People's Car was launched. The Bassin Bantam, with two engines, a 10hp twin horizontal engine and a 12hp 4-cylinder. The car was to be manufactured by Bassin Motors Pty Ltd at their works in William Street, Sydney using a body constructed of laminated wood

Fig. Al.51
1945 MCM car.
Modern Magazines




JB MINOR

See the Model of this really economical Queensland made car in building 3, Q.I.F.

**IT'S NEW!
IT'S SENSATIONAL!
IT'S QUEENSLAND MADE!**

The prototype of this new light car will be on display at the Queensland Industries Fair. It features:—

- Hydraulic Transmission.
- Front Wheel Drive.
- Three-Wheel Independent Coil Springing.
- Hydro-balanced Rearwheel Steering.
- All metal construction.
- Is the lowest priced car available.

THE "J.B. MINOR" Manufactured for AUTOMOTIVE COMPANY OF AUST.,
by **JEFFRESS BROS.**
NORTHGATE RD., NORTHGATE, BRISBANE.
Associate Company,
JEFFRESS FOUNDRIES PTY., LTD.

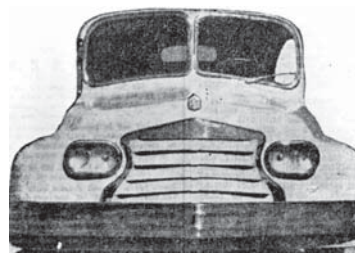
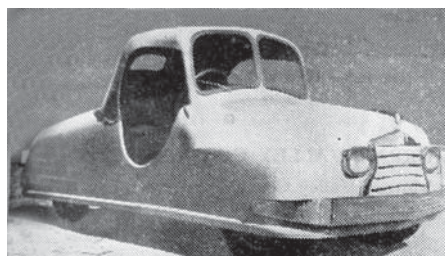
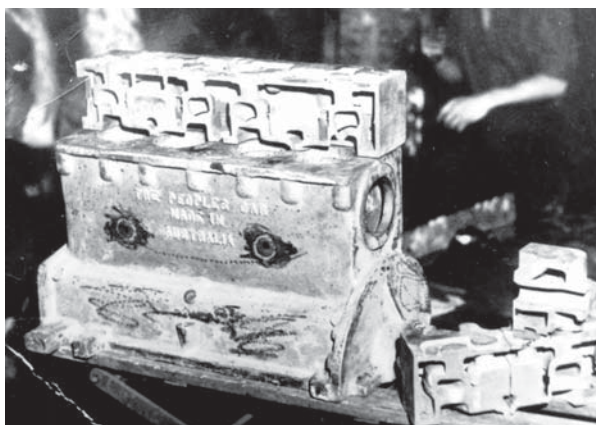


Fig. Al.52
JB Minor car built by the Jeffress Bros.
State Library of Queensland

Fig. Al.53
Peoples Car engine block castings ex Horsham Foundry.
Ivan Hoffman



and steel panels. Suspension was a novel torsion bar system and the car had a high ground clearance. A photograph published in *Truth* (Sydney) shows a two-seat roadster with woodie style door and rear quarter panels.⁸³ Bassin Motors was formed in 1920 and by 1950 were agents for the Lloyd 650 car (English), this may be a clue to the Bassin's design origins, but the Lloyd car had a 2-cylinder engine. The suspension - a novel system based on horizontal coil springs in oil - does not match the Bassin torsion bar suspension. There is a possibility the Peoples Car engine block, shown above, was related to the Bassin project and the reported torsion suspension was the horizontal spring system as used on the Lloyd 650.

Brisbane Lanchester dealer, former English speedway driver, Jean Reville, announced in July 1950 he was producing a 10hp 4-cylinder front wheel drive jeep type vehicle. Reville Motors Pty Ltd was registered on 18 July 1947 to retail and manufacture cars and rural vehicles. The Reville Ranger was based on a pre-war chassis design by Palmer-Reville & Co of Wimbledon, England, a company part owned by Reville that produced the Palmer sports and racing cars. These vehicles used the BSA front wheel drive, a system Reville incorporated in his Ranger with a Lanchester 10 engine and Daimler Fluid Flywheel and Multi-Variable automatic transmission system. Reville planned to sell his vehicle at £500 and later install an engine of his own design. Brisbane engineers, Evans Deakin, were to produce the rigid tubular chassis with a wheelbase of 105½.⁸⁴ (Fig. AI.54)

In September 1953 R P Tilbrook announced a 3-wheeled miniature car in Adelaide. Production was initially set at one vehicle per week building up to 7 per week in Tilbrook's motorcycle factory. Powered by a 197cc Villers motorcycle engine and 4-speed transmission, the Tilbrook was expected to have a top speed on 58mph and obtain 95mpg. The body was steel on a tubular space frame and designed to bounce off another vehicle in a collision. Price was set at £395 plus tax, but nothing came of the proposal.⁸⁵

Specials

A number of registered single built sports and racing cars were produced from the late 1930s. The racing cars are documented in John Blanden's *Historic Racing Cars in Australia* (1979).⁸⁶ Perhaps the most significant car was the Maybach made by Charlie Dean with assistance from REPCO and enthusiasts from Holden, Jack Joyce and Tom Molnar. Constructed using a Maybach engine from a German half-track vehicle, Fiat gearbox, Lancia rear axle and Studebaker front suspension, the Mayback became one of the country's famous racing cars.⁸⁷ The Mayback, Chamberlain 8 (Beetle), Ausca and Molina Monza were featured in *Shifting Gear: Design Innovation and the Australian car* (2015)⁹⁶ Smaller projects included Clarrie and Ron Head's Cadillac Special sports car. Built using an army surplus tank engine, the Cadillac was constructed in the Head Brothers Murrumbena workshop in 1949. It was later destroyed in a motor race by owner, Mr Cooper.⁹⁷ (Fig. AI.55)

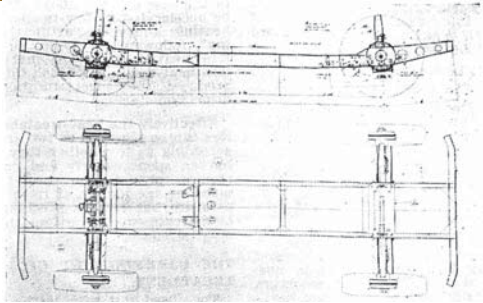
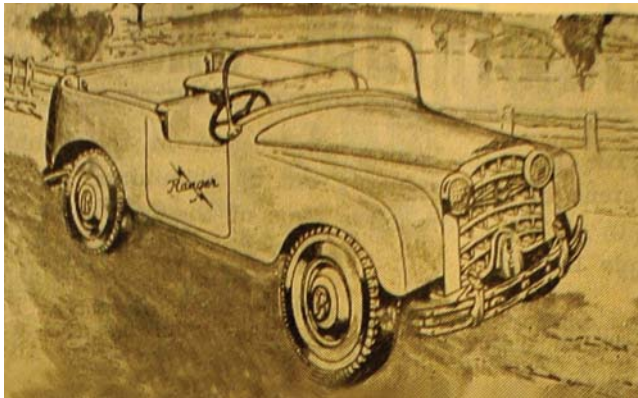


Fig. AI.54 Reville Ranger vehicle and chassis.

The Coach & Motor Body Builder



Fig. AI.55
1949 Head Bros Cadillac
Special.

GM-H People

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Appendix II: Designer biographies

The designers listed here are identified as having played a role in Australian automotive design post-1930. Designers prior to this period are discussed in detail in the section dealing with their effort i.e., Thomson, Tarrant and Sutton are covered in chapter 2. The principal designers identified are those who initially trained under Herbert Wylie at Woodville South Australia and worked in the GM-H body program through the 1930s, those who contributed to the 48-215 Holden project (Fig. AIII.1) and individuals from other companies e.g. Lewis Bandt, Bob Chamberlain and Albert Spooner.



Fig. AII.1 GM-H 48-215 Holden designers taken on 15 June 1946 in Detroit. L to R back. Cliff Kaye, Glen Sinclair, Jack Rawnsley, Tom Wylie.

Front. Val Stacey, Charlie Phillips, John Buckley, Bill Abbott and George Quarry.

Holden Ltd

Robert Lyndsay (Bill) Abbott (1913-1995) the son of civil engineer, Arthur Abbott, and Edith Pyke, Abbott grew up in Balwyn, a suburb of Melbourne. Abbott joined GM-H engineering in 1935 then completed his civil engineering degree at University of Melbourne. When war erupted GM-H sent him to the USA to gain experience in munitions. Following a successful period at GM-H developing the 48-215 to FB Holden, Abbott was one of five engineers head-hunted by British Motor Corporation (BMC) to establish a new Product Engineering Department in 1957. As Chief Product Engineer, he is credited with the introduction of the Mini 850 into Australia. Abbott took with him former Vauxhall engineer, Bill Serjeantson, who later succeeded him when Abbott was made the BMC Manufacturing Director. Abbott then became head of the Commonwealth Aircraft Corporation in January 1970, retiring in 1978. Abbott moved to Port Macquarie where he passed away on 11 November 1995 aged 82.¹

Louis (Lewis) Thornlett Bandt (1910-1987) commenced work for Duncan & Fraser as an apprentice fitter and turner in 1924, moving then into body design drafting, where Bandt worked on custom made bodies. When Duncan & Fraser lost the Ford contract in 1927 Bandt moved to the Melbourne Motor Body works, specialising in drawing custom motor bodies. In 1929 he took a position with the Ford Motor Company at Geelong, completing 46 years as their chief body designer. Bandt was born in Moonta, South Australia, to Louis Bandt senior and Ethel Hobbs on 26 February 1910. On 6 September 1941 Bandt married Nellie Rowe in Adelaide, they raised three daughters in Geelong. During his career he won three design awards, 1937, 1947 and 1948. In retirement Bandt converted and restored a 1934 Ford sedan into a coupé utility, driving it regularly round Geelong. Unfortunately, it was in this vehicle he was killed on 18 March 1987 in a collision following a TV interview.² Bandt is credited with the coupé utility design, the Ford Club coupé of 1939 (Sloper), a fast back utility for 1942 that was stillborn, the localised V8 Custom, Anglia, Prefect, Consul and Zephyr models, creating coupé utility, panel van and station wagon versions. A number of one-off bodies were also created, including a 1960 Falcon convertible (five produced at Bodycraft Geelong) and a 1968 Falcon 2-door. A big success was the conversion of the Falcon sedan into a Fairlane in 1967, using imported rear panels, the same process was achieved with building the 1966 Falcon hardtops.³ Bandt was President of the Geelong branch of the Society of Automotive Engineers and presented many papers to the society. A Bandt archive is housed in the State Library of Victoria.⁴



Fig. AII.2 Lewis Bandt

E L Ford

Fig. AII.3 Lewis Bandt (standing) with possibly fellow designer Jack Taylor with line drawing of a V8 Mainline utility c1950.

Seivers - Ford Motor Co

Charles Frederick Beauvais (1895-1971), the son of a French lithographer, artist and photographer, who shared his father's name, was born in London. When Beauvais senior returned to Marseilles to manage his own business the family followed on the death of their father in 1909 the family returned to London. Beauvais started work at 16 as a clerk and by 1920 had registered a patent, *A friction driving mechanism for motor road and other vehicles*. Beauvais married Florence Coker in 1916 and emigrated to Australia in 1937 working as a freelance journalist for *The Autocar* magazine writing a column *Motoring Down Under*. In 1921 he had developed his own car, the CFB under the CFB Car Syndicate and between 1922-1924, while at the Plycar company, he designed the Bow-V car, a light cycle car. Beauvais also worked as designer for the Star Motor Co and from 1930 the New Avon Body Co in England. In 1933 he became



Fig. AII.4 **J Lee**

Fig. AII.5 Frederick Beauvais's sketch of a future car drawn in 1936 and promoted in Australian newspapers and magazines in 1948.

Powerhouse Museum

Fig. AII.6 Frederick Beauvais's graphically illustrated model cleverly cut to reveal the interior.

J Lee



the Crossley Motors chief designer, also holding a position as technical editor with *The Motor*.⁵ Beauvais developed a design for a rear engine car in 1936, promoting it widely in the English and Australian motoring press. This car was set on a 10-foot wheelbase and featured a streamlined body.⁶ Beauvais produced a coloured sketch and 1½-inch scale model that are both now held by the Powerhouse Museum. In 1938 he joined General Motors-Holden at Fishermans Bend as a stylist/designer in the special body design engineering section.⁷ This group was responsible for low volume body design and during the late 1930s produced unique styles for a mail coach, parlour coaches, a Governor's convertible and fire tenders.⁸ In late 1940 Beauvais joined the *Argus* as Staff Artist-Engineer and in 1948 established the Industrial Styling Company in Sydney. He was a student of the Norman Bel Geddes and Raymond Loewy ideals and claimed he was: “capable of reshaping things into forms attractive to the eye without transgressing mechanical laws or upsetting practical requirements.”⁹

Russell Stuart Begg (1887-1957) had a long career in automotive body design working for a number of auto companies including Packard, Hudson, Thomas, Jeffery. He joined the Jordan Motor Car Company from its inception in 1916 as Chief Engineer and Designer. In March 1920 Begg quit the Jordan company to become the Budd Wheel Company chief engineer and an associate chief engineer of Budd manufacturing. Budd worked with the pioneer steel body designers, Edward Budd and Joseph Ledwinka on a front wheel drive prototype that was used by Andre Citroën as a basis for his Traction Avant vehicle.¹⁰ Following his term with Budd, Begg spent time at Stutz then joined Midland



Fig. AII.7 Left. Russ Begg with Ed Jordan **Holden Ltd**

Steel before being assigned as engineer-in-charge of the GM Product Study Group around 1933. In this capacity Begg oversaw the development of the Opel Olympia body with staff from Ambi-Budd Presse Werke, then in 1936 as the Opel Assistant Chief Engineer, the Kaptain body. Begg came to Australia with the engineering team and in 1947 became Holden's chief engineer, a position he held until his retirement in 1952. Begg retired to Florida with his wife and passed away in 1957.¹¹

Jack Burgan (1912-2000) born in Broken Hill, New South Wales, commenced in the GM-H Birkenhead Plant SA as an office boy in 1927 and by 1932 was working in the Woodville drawing office. Burgan moved to the new Woodville Styling section as an illustrator after 1939 then transferred to Fishermans Bend. Burgan was the son of Henry and Beatrice Burgan and in 1936 married Ethel Siviour in Woodville, South Australia. Burgan worked as a stylist at Fishermans Bend until retiring in December he passed away in 2000 in South Australia.¹²



Fig. AII.8

Holden Ltd

1972,

Alan Hawker (Bob) Chamberlain (1908-1992) was born on 16 July 1908 to Albert Chamberlain and Maude Hawker. Perhaps best known for the Chamberlain tractor, he grew up surrounded by automobiles, mechanical invention and a famous uncle, Harry Hawker. His father, with others, ran the C.L.C. garage in Elsternwick, Victoria, repairing and selling Crossley cars, then from 1914 worked for the British Imperial Oil Company (later Shell), finally establishing the Australian Ball Bearing Company in 1919. The detailed work of the Chamberlain brothers, Bob and Bill, has been documented in Jim Hazelden's *The Chamberlain – An Australian Story* (2003) and Bruce Lindsay's *Chamberlain – Australian Innovator* (2007).¹³ The brothers were both prolific inventors, engineers and in Bob's case the holder of many patents ranging from a hydraulic transmission in 1931, improved suspension system in 1936, piston design in 1973 and 1949 and an outboard marine drive in 1965.

Chamberlain's first vehicle, The Beetle, (Fig. AIII.8) was constructed in the family factory in 1929 using a space frame of 5/8-inch tube oxy-welded with gussets in a form that provided a smooth surface for a streamlined aluminium body. Unusually for a purpose-built race car, it had two seats and was

registered. Initially power was supplied by a Daytona Indian 2-cylinder air cooled engine developing 50bhp @ 5,000rpm with dual spark plugs and a cast alloy sump. An Altoona motor cycle engine followed the Indian engine then Bill Chamberlain designed and built a new 1,100cc 4-cylinder 2-stroke in 1935.¹⁴ (Fig. AIII.9) Using a stepped bore with eight pistons, vertically opposed and a supercharger, the motor developed over 85bhp and could rev to 8,000rpm. The front wheel drive system used inboard brakes and suspension was independent all round with transverse springs, fabricated wishbones and rear trailing radius rods.¹⁵ Chamberlain once said of the vehicle: "I am willing to bet £20 to a packet of cigarettes that I can go up Swanston-street, Melbourne, at 55 miles per hour, and, without slackening speed, turn completely around and come back again at the same speed."¹⁶

It was reported that Chamberlain intended to develop the design into a saleable vehicle with a coach-built body and his recently patented hydraulic transmission. Regretfully, this dream did not eventuate as Chamberlain went to America and Europe in 1934 and saw the direction car design was moving.¹⁷ This report of a passenger car was highly sceptical as there is no evidence in the Chamberlain family history that supports this idea. A vehicle that impressed Chamberlain was the Dr Porsche designed Auto Union GP racing car. In the early 1930s the German auto designers, led by Joseph Ganz, pioneered low slung, rear engine, small 2-seater cars with swing axles and a simple tube backbone chassis, the Volkswagen. Mercedes (Fig. AIII.11), BMW, Adler and Standard-Superior all produced vehicles with this chassis design. Porsche adopted the ideas for the Auto Union racer and later, under Hitler's direction, the VW. Ganz's role in the development was expunged by the Nazis due to his Jewish heritage; Ganz escaped Germany and eventually arrived in Australia,

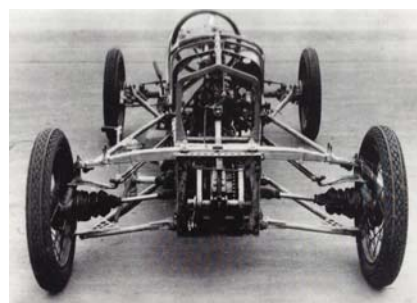
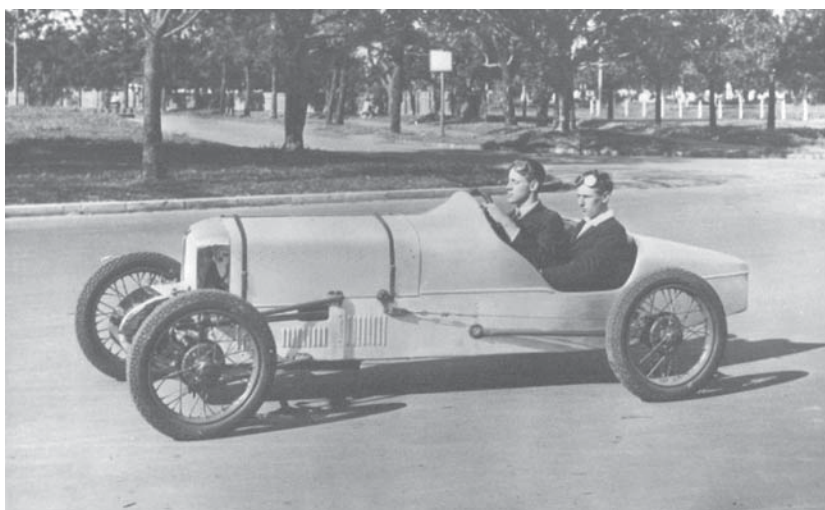


Fig. AIII.9 The Chamberlain Beetle.

Chamberlain Archive VCCA

working for GM-H. He died bitter, broken and unrecognised in January 1967.¹⁸ Chamberlain's next car design would follow the European trend with independent suspension, swing axles and a rear engine, except Chamberlain would use a space frame chassis and his own patented suspension units. The engine was intended to be a 4-cylinder 2.4 litre. Chamberlain went as far as having a block and heads cast for this engine. A Ford side valve V8 was used rather than pursuing the 4-cylinder engine. (Fig. AIII.10) The body styling reflected Paul Jaray's work from 1935. In later years Chamberlain completed the restoration of a 1910 Prinz Heinrich Benz (1986) and built a replica of the 1904 Napier Sampson car. Chamberlain passed away on 5 October 1992.¹⁹

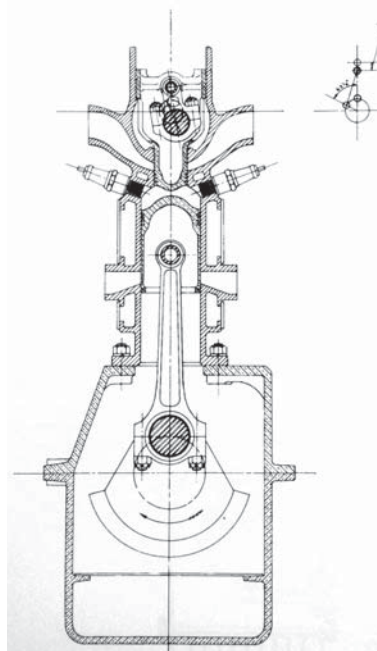
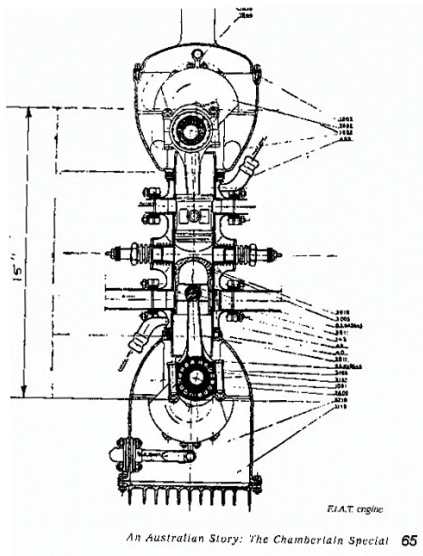
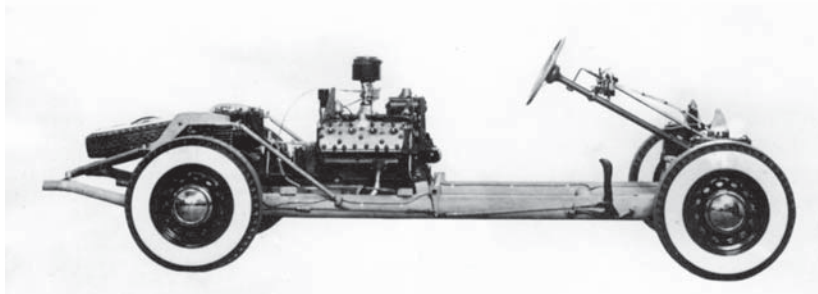


Fig. AII.11 Above. The Chamberlain 1938 proposed Australian car chassis compared to the Mercedes 130H chassis..

Chamberlain Archive VCCA

Fig. AII.10 Left. The Chamberlain Beetle engine drawings.

Chamberlain Archive VCCA

Hartley Melvin Chaplin (1899-1970) Chaplin trained under Bert Wylie in 1923 having studied at Unley District High School, South Australia. He left Holden to become the Whitingslow assistant production engineer, then he found himself back at Holden when they purchased the company. After serving in the Woodville engineering department he became the chief tooling engineer in the late 1930s, returning to engineering after the war as a body engineer working on body sound proofing, sealing and structure.²⁰ Chaplin was born in Adelaide to Herbert and Maria and married Marjorie Anderson in 1922. He died in Caulfield, Victoria, in November 1970 aged 71.



Fig. AII.12
Holden Ltd

Rupert Lon Jeffkins (Jiffkins) (1881-1954) is known for his exploits on the motor racing circuits, particularly Indianapolis where he competed three times (1910-1912), gaining the reputation as a dare-devil. Jeffkins was born to William and Clare Jiffkins in East Maitland, NSW, his name spelling appears to change on his second marriage to Hazel Bell in Indiana in 1911. Jeffkins was a former sergeant HM 76th Regiment and entered France after 1901 to work at the Serpolette factory and also compete in the de Boulogne Sur Mur road races. By 1904 Jeffkins was in America working with David Dunbar who was at that time starting up his Buick company. Then followed a series of mechanical design and test driver positions with White (steam car), in which he set a speed record of 130mph at Daytona-Ormond beach, Overland (1909) and Harry Stutz (1910). Jeffkins returned to Australia in 1919 and immediately began promoting dirt track racing. He also joined William Bell Foulis (1877-1944) and the Roo Manufacturing Company developing the cars suspension and a Raceabout version. Unfortunately, the war created funding difficulties and the Roo's backers pulled out, leaving Jeffkins in financial difficulties. Jeffkins continued



Fig. AII.13
Jeffkins Family

to develop his race-a-bout design, patenting a caster-action suspension and carburettor. Working with Billy Foulis at Foulis' National Motor and Engineering Works (est. 1909), Jeffkins set about attracting capital for a new Australian car venture. An office at Chancery House in Sydney was opened and drawings for a 15hp 4-cylinder light car commenced. The chassis was to be constructed from aluminium, have a 104-inch wheelbase and weigh 9cwt; it was designed using ideas from Jeffkins time working with Harry Stutz. Unfortunately for Jeffkins late 1929 was not a great time for capital raising and despite positive claims in January 1930 the project folded.

Jeffkins died a pauper following a stay in a home for the destitute and is buried in the Liverpool cemetery, a simple marker was financed by two American Indy race enthusiasts.²¹

Reginald Theodore Hall (1914-1979) commenced working at Holden Motor Body Builders as a mail boy in 1928. His father, Thomas, an Englishman, was an electrician and magician and his mother, Catarina, was of Swiss (Italian speaker) decent. Hall was born in 1914 making him just 14 when he went to work. After 6 months he showed a good deal of interest in the drawing office in Woodville where he was employed. Following night school studies Hall worked as a Junior Mechanical Draftsman and then after body drafting tuition under Bert Wylie, he was appointed as a Body Layout Draftsman. By 1933 Hall was a drafting supervisor in the Woodville drawing office. Around 1938 Hall became the Holden Body Chief Body Draftsman.



Fig. AII.14
Holden Ltd

In 1945 he was one of the team of Holden engineers/draftsman to go to America to work on the new Holden car. Hall had a natural talent of seeing body layout drawings in three dimensions. He was totally involved with a task and expected others to work at his pace, which was frenetic. A story goes that while in Detroit the American draftsmen put a bucket of water next to his layout table, to cool his pencil.

In 1949, Hall was appointed Holden's Assistant Body Engineer, aged 35, at Fishermans Bend Engineering, then in 1967 he became the assistant chief engineer: Body. A story Hall was always keen to tell related to the thin front pillars of the HQ Holden. The Australian Design Rule specified the pillar to be

only as thick as the distance between the eyes (average), Rolls Royce engineers told the Government it could not be done, Hall said it could and proved so, nevertheless Rolls continued to lobby and the ADR requirement was cancelled. Hall retired in March 1977, passing away within just two short years.²²

Frank Hershey (1907-1997) a GM stylist under Harley Earl was twice involved with GM-Holden. Initially, Hershey came to Australia in 1938 to establish the GM-H styling studio at Woodville. In 1945 he again became involved with Holden when assigned to the Overseas Styling Studio and asked to prepare sketches for the proposed 48-215 Holden. Hershey continued to provide advice on styling matters until he was reassigned to Cadillac, where in 1948 he put fins on the new clay model. Hershey left GM to establish his own studio. Later he worked at Packard and Ford, producing the iconic Ford Thunderbird.²³



Fig. AII.15 Frank Hershey (left) working on the Pontiac Silver Streak.

GM

Frederick George James (1915-2007) born in Perth to Alfred and Alfreda James, he developed an early passion for cars becoming a member of the Western Australian Sporting Car Club and racing a Morris Minor Special that he drove in the Albany Grand Prix between 1936 and 1938. James was involved in the preparation of the Australian Grand Prix winning MG TA of Allan Tomlinson in 1939. James studied Engineering at University of WA, graduating in 1938. At the end of 1938 James boarded the Orient liner for England where he quickly obtained employment with Vauxhall Motors engineering. When war erupted he was assigned to the team designing the Churchill tank 12-cylinder engine.²⁴



Fig. AII.16

Holden Ltd

When his mother became ill in 1941 he boarded a small freighter and returned to Australia via America. On arrival James joined GM-H Engineering at Fishermans Bend and in 1944 was assigned to the Australian car project as a mechanical engineer.

James spent time in Detroit working with the first Holden design team, then returned to become the engine accessories engineer. James was also involved in the local design of the Holden red 6-cylinder engines in 1962-1963 as a senior engine design engineer. Two years later, as head of the engine section, James toured America surveying V8 engines, returning to design and build the 253/308 V8 with Ed Silins. Australia's first V8 engine, released in the 1969 HT Holden, saw hundreds of thousands power Holden cars over the years. At a special ceremony to salute the last Aussie V8 produced in June 1999, James, said there was a strong national push for an Australian-designed engine:

We knew General Motors would be watching our every move, consequently our engine had to be better than anything else currently in production. I think we did a pretty good job of achieving our objectives. For sheer longevity, I think the only other engine to compare would be the Chevrolet V8.²⁵

James was also instrumental in the design of the Torana XU-1 engines, working closely with Harry Firth to produce what became known as "The Giant Killer" because it defeated the larger V8 Falcon.

James settled in Phillip Island when he retired from GM-H in 1977. He maintained links with Holden for some time with his involvement in the homologation of Holden cars for racing. James passed away at Phillip Island on 18 October 2007 aged 92.

Clifford Albert Kaye (1898-1989) an English machine design engineer, immigrated to Melbourne, taking a position as Chief Draftsman at Dunlop, then became the Principal at the Melbourne School of Mechanical Drawing and consulting engineer in the Temple Court building. Temple Court was the location of the GM Export office and when General Motors Australia (GMA) was established in 1926, located in the old Export office, Kaye joined the



Fig. AII.17
Holden Ltd

new enterprise, charged with the job of drawing up the layout and equipment plans of GMA's new assembly plants in Melbourne, Sydney, Adelaide, Perth and Brisbane. Following the Holden-GMA merger, Kaye worked as a liaison between the Melbourne and Woodville engineering groups.²⁶ In 1944 he went with Hartnett to Detroit to prepare the case for an Australian car. Kaye became Holden's Experimental and CKD Engineer, a position he held until his retirement in 1963.

Charles R Lewis (1911-2013) came to GM-H as part of the American Engineering team in December 1946. Lewis had been assigned the task of translating the Holden specification into the American built prototypes. Educated in Anderson Indiana, Lewis went to work at the Dean Hill Pump Company, Welsh Aircraft, Warner Gear Company and then Robinson Aircraft Engine Company as their Chief of Design. In 1934 Lewis joined Oldsmobile as a designer, later working on automatic aircraft cannons during the war. In 1944 he was reassigned to Central Engineering Styling section. Lewis was a keen motor cycle racer, flew sporting aircraft and was a lay preacher.²⁷



Fig. AII.18
Holden Ltd

On the retirement of Begg, Lewis was appointed GM-H Chief Engineer and in February 1953 became a member of the GM-H board, retiring in 1966.²⁸ Lewis was replaced by Wayne Brown, also American, in February 1957, then Lewis returned home where he passed away in May 2013 at Grand Rapids, Michigan, aged 92 years. Lewis had been born in Abbeville, Mississippi to William Lewis and Sarah Blakely and served 30 years with GM.²⁹

Frank Wilson Gillies Mathwin (1902-1970) was born at Nathalia, Victoria, to Dr Frank Sirret Mathwin and Gertrude Wilson. By 1926 he had moved to North Adelaide. Mathwin went to work as an illustrator in the newly established Woodville styling art studio just prior to the outbreak of war. By 1945 he had the title of Styling Supervisor and was working on Holden's project 2000. In 1946 Mathwin prepared sketches of the proposed Holden 48-215 instrument panel and ash tray that was concealed cleverly in the radio speaker grille.³⁰ Mathwin relocated to Mont Albert, Victoria with his wife Evelyn Brocksopp when

Styling and Engineering moved to Fishermans Bend. In 1950 Mathwin was responsible for styling the Holden coupé utility design and in 1952 was sent to GM Detroit Styling centre to study trim and vehicle interiors, returning to head this section until his retirement in 1967. Mathwin was an accomplished artist and model maker, producing many of the Project 2000 models, some of which ended up in the sand pit of his young son.



Fig. AII.19

B John

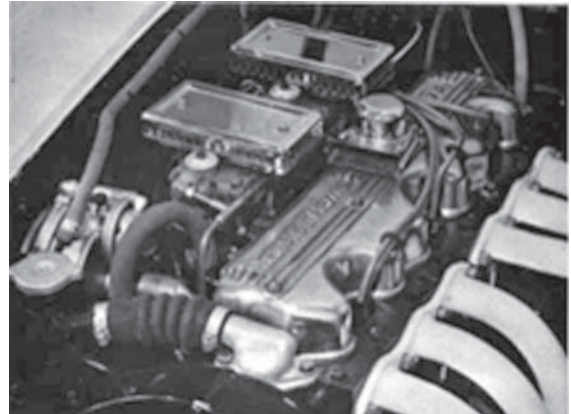
Fig. AII.20 Left. Gill Mathwin (standing) with Jack Burgan in the GM-H Interior Styling Studio c1964.

Jim Colias

Thomas Molnar (1921-) was born in Steyr, Austria to teachers and was raised in what has been called an education-rich environment. Following four years technical college and a scholarship to the German Technical University, Molnar graduated with the equivalent of a Bachelor of Engineering. Following the war Molnar briefly worked at the Steyr Technical College then emigrated to Australia in 1950, working out two years of contract with the Commonwealth, finishing as a technical draftsman.

In 1952 Molnar commenced work in the GM-H Technical Engineering drawing office, staying seven years working on Holden body structure and chassis design. During this time Molnar became involved with the Maybach racing car working on weekends with Charlie Dean on the Mk3. In 1957 Molnar was given the responsibility for designing a small coupé utility to be based on a Vauxhall 4-cylinder chassis. Code named F/1606 the ute was to compete with the Morris Minor however the project was abandoned following the decision to redesign the Holden body for the FB series.

In 1955 Molnar embarked on a second private project with Charlie Dean and Repco, known as the Repco Special Project it was initially to be a Holden based



The car you'll never drive ...

Australia's top motoring writers and authorities have driven it . . .

The product of over 30 years' automotive experience . . . the Repco experimental car (shown and below)

And they've been enthusiastic in their praise . . . designed and built in Australia by Australians from Australian components. It's been sustained as a triumph of Australian automotive engineering . . . BUT it's not on the market! Now is it ever likely to be for Repco's experimental car (illustrated above) is a laboratory on wheels . . . a mobile testing-station for Repco products . . . a symbol of the way Repco research and engineering works for YOU . . . so wonder more than a million Australian vehicle owners have made their first choice Repco Super 'X' Piston Rings for renewal of engine power and operating economy . . . like the Repco experimental car, Repco Super 'X' Piston Rings are the product of more than 30 years' experience in the automotive industry of Australia . . . the same research and the same applied engineering and manufacturing skills that built the Repco car are also applied to the manufacture of Super 'X' . . . for retained power and performance, rest assured you can really rely on . . .

REPCO ENGINEERED PRODUCTS
 Super 'X' rings for re-rings;
 R.R. rings for re-assembly;
 engine bearings; ring gears;
 pistons; piston pins; valve
 guides; cylinder sleeve assm-
 blies; hose clips and Gold Star
 magnets.

Repco Super X
PISTON RINGS

Fig. AII.21 The Repco Record or Special as it was known originally was painted red with a stabilising fin on the rear (see Repco advert).

T Molnar



Fig. AII.22

T Molnar

Fig. AII.23 Repco advertising c1958 using the Repco special as a promotion for the companies piston rings.

T Molnar

sports roadster but ended up as a GT style car. The Repco Record, as it became known, was used as a test bed and publicity vehicle. Molnar designed a space frame using an FE Holden cross-member and suspension parts and believed he could convince Dean and Phil Irving to develop an independent torsion bar rear suspension, this was rejected in favour of the tried and true quarter-elliptic leaf spring Holden axle design. Irving fitted his Hi-power Repco head to the Holden engine, new camshaft and hi-compression pistons to provided 133bhp @ 5,500rpm. An Aston Martin 4-speed transmission was coupled to the Holden rear axle.

In 1959 he joined Repco as the Patent Brakes chief engineer, then chief engineer at the Repco-Research laboratory and finally the general and engineering manager of Cooldrive. During his time at REPCO Molnar designed and developed the first Australian disc brake calliper, the world's first 4-wheel disc brake system for trucks, load sensitive proportioning valves for Holden 4-wheel disc brakes and light weight disc brake callipers for racing cars.

Molnar retired from Repco in 1980 and formed his own company, D & T Design Service Pty Ltd, touring the world as a consultant engineer. He was awarded the Prince Philip prize for Australian design in September 1979, is a fellow of the Institution of Engineers Australia and Society of Automotive Engineers (USA).³¹

Charles Alan Paterson (1914-2004) was born on 27 August to Tom Paterson, a civil engineer, and Clara Clement in Perth West Australia. In 1943 he married Ailsa Reid in Sydney. Paterson studied mechanical engineering at the University of Sydney then in 1937 joined a family agricultural equipment company, Paterson Bros. In 1938 he joined Howard Auto Consultants as a draftsman and design engineer. In 1943 Paterson became the experimental engineer on the Gray Marine diesel project at GM-H's Pagewood plant and from 1945 was assigned to the 48-215 program as an experimental engineer, travelling to Detroit and then supervising the road testing of the prototypes through Melbourne's outer suburbs and countryside. Paterson continued as the Experimental



Fig. AII.24
Holden Ltd

Engineer between 1954-1970. On 16 January 1970 he became Holden's Safety Engineer, a position he held until retirement in 1979. Paterson passed away on 31 October 2004. He was one of three of the original designers highlighted by GM-H during their 50th Holden Anniversary celebrations in 1998.³²

Horace Alfred George Payze (1909-1992) of Adelaide was a natural artist who studied at the South Australian School of Arts & Crafts between 1924 and 1928. In 1934 Payze won a design competition for the Mt Lofty Pioneer Tower. Following the establishment of the styling studio in Woodville in 1938 Payze was employed as an illustrator. He oversaw the development of Hartnett's Project 2000 styling before transferring to Fishermans Bend in 1948. Payze became Holden's chief stylist in 1952 and was responsible for the clean straight lines of the FE-FC then the FB-EK and EJ models. Payze is remembered as, "a brilliant and painstaking craftsman, renown throughout the company for his talent and versatility."³³

Payze was the son of Melroy Payze and Mable Guignon, he married Eva Prowse in August 1940 and the couple raised a son, he was a talented artist and prepared his own Christmas cards each year. Payze retired on 31 July 1974 and passed away in Frankston on 19 April 1992 aged 82.

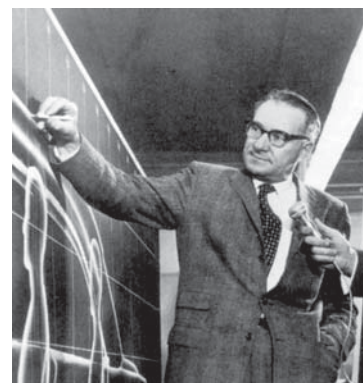
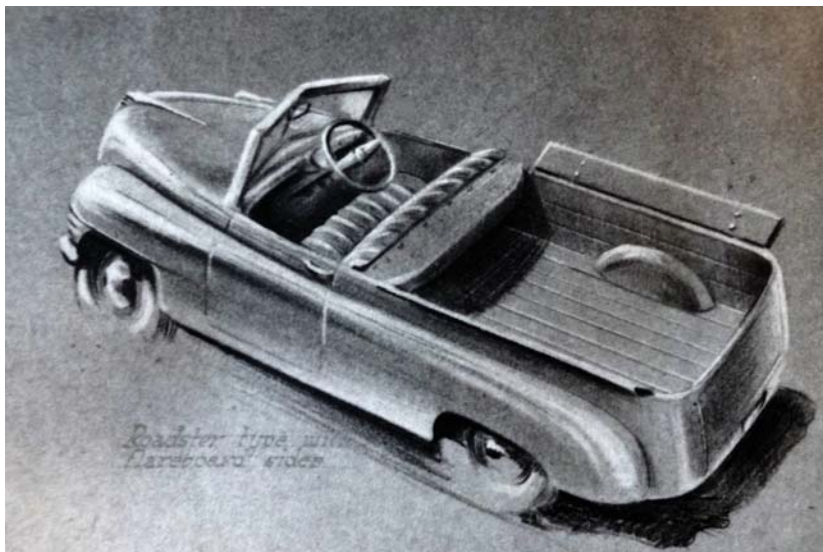


Fig. AII.25

Holden Ltd

Fig. AII.26 Alf Payze sketch of a Project 2000 open "Wellside" utility.

Melb University - Hartnett Archive

Charles Harry Phillips (1909-1996) the son of a plumber was born in Battersea, England to Charles Phillips and Annie Buttle. Phillips started at Holden Motor Body Builders as an apprentice coachbuilder on 5 July 1923, he then joined the drawing office under Bert Wylie, becoming the lead draftsman responsible for all bodies on imported chassis. During the depression Phillips was made the pattern shop foreman but returned to the drawing office in late 1932 to prepare for the 1934 model bodies, he was responsible for adapting Holden's bodies to



Fig. AII.27

Holden Ltd

imported chassis like Hillman, Chrysler, Willys, Singer and Graham Paige. In 1937 Phillips became the drafting trainer, taking each new trainee for three months' tuition.³⁴ In 1939 Phillips was appointed a design body engineer and during the war worked on the Beaufort project, then in 1944 he went to America as a body engineer returning to become the assistant body engineer, and in 1949 the chief body engineer at Fishermans Bend.³⁵ Phillips retired in March 1970.

Norman Alexander Pointer (1898-1948) was born in Warwickshire, England to Thomas Pointer and Ada Anderson. The family emigrated to Australia in 1911. Pointer enlisted in June 1918 having trained as a draftsman, and on route overseas was quarantined with an infection. Following his discharge, he enrolled in a Mechanical Engineering course at the Adelaide School of Mines & Industries then joined the Forward Downs mining equipment company where in 1924 he supervised the design and building of Holden Motor Body Builder's first panel press.³⁶ Pointer joined GM-H in South Melbourne as The technical engineer in 1931, returning to South Australia in 1932 in the same position. In 1934 he married Gabriel Sutherland then moved to Melbourne to work with Managing Director Larry Hartnett, E J Gibson (construction engineer) and John Storey (Director of Manufacturing) as the equipment engineer on the new Fishermans Bend plant.³⁷ Following the outbreak of war Pointer went to Pagewood, NSW to oversee the Gray Marine Diesel project, in April 1942 he was appointed the GM-H Chief Engineer, supervising both Fishermans Bend and Woodville Engineering departments. Pointer oversaw the transfer of the Woodville engineering personal to Fishermans Bend in September 1945 and then the initial development of the Holden car. During 1947 he became ill, passing away in January 1948 at 49 years. Pointer served on the Institute of Automotive Engineers Council through the 1930s.



Fig. AII.28
Holden Ltd

George Alfred Quarry (1911-1957) was appointed the Engineering Assistant Chief Engineer in charge of Design in February 1953, he had spent 18 months in Detroit as Holden's liaison engineer on the Holden project. Quarry, a trained engineer, commenced in 1934 as a draftsman at the South Melbourne plant and was one of the first two GM-H employees to gain an overseas training in 1939 at Opel.³⁸



Fig. AII.29
George Quarry photographed
with the first prototype Holden
in Detroit.

Holden Ltd

Roy Cleon Rainsford (1911-2006) one of the original five draftsmen taught by Herbert Wylie in 1927, grew up with three siblings, all born in Parkside South Australia to Harold Rainsford and Isobel Dewsnap. Rainsford worked in the Woodville drawing office until 1933 when promoted to a senior layout draftsman in charge of both body layouts and die and jig tooling layouts. In 1936 he became the chief draftsman supervising 20 draftsmen, then in 1938 was appointed a body design engineer in charge of the body-in-white and trim. When war erupted Rainsford became the Woodville engineering supervisor and in 1942 the assistant chief engineer under N A Pointer, transferring to Fishermans Bend in September 1945 when he was appointed assistant chief engineer – Body & Styling.⁵¹ In this role he played an important part in the Holden car project overseeing the body design component. Following his return from working in America on the project he took a position with Chrysler Australia, returning to South Australia to work as the chief engineer in 1950 and in this role he oversaw changes to the American product to achieve local content at minimum engineering cost. By taking the 1954 American body Rainsford was able to create a modern product, the Chrysler Royal, for 1955 by simply reskinning the body shell.⁵² Rainsford rose to become Chrysler’s Deputy Chairman in May 1974 and retired in 1976.



Fig. AII.30
Rainsford Family

John William (Jack) Rawnsley (1911-2011) finished a technical education aged 15 and commenced work with a South Melbourne plumbing business, then followed time with the railways and then engineers, Gardner & Co as a junior draftsman, at this time he commenced engineering studies at South Melbourne Technical school. In January 1936 he commenced work at GM-H as a cadet engineer having been recommended for the position by the school principal.³⁹ In 1940 Rawnsley, the son of James Rawnsley and Edith Richards married Beryl Trahan.⁴⁰



Fig. AII.31

Holden Ltd

Initially working with the plant and equipment section on the new Fishermans Bend plant before being sent to Sydney as a project engineer on the Pagewood plant construction. When war commenced Rawnsley became involved in the 25lb Howitzer field gun project. Following the war Rawnsley was assigned to Project 2000 and then sent to Detroit to work as the liaison engineer with Begg on the Holden project.⁴¹ Rawnsley was appointed Holden chassis engineer and in 1971 was assigned to Opel as Holden's resident engineer, working on the Opel T-car, later sold in Australia as an Isuzu Gemini and on retirement he took up teaching technical drafting to year nine and ten secondary students. Rawnsley passed away aged 99 years in February 2011, he was the last of the original Holden design team as Holden MD, Mike Devereux said:

Jack and his colleagues were true pioneers and paved the way not just for Holden's success but for Australian automotive industry as a whole. With Jack's passing we lose a cherished link with our past. A daily reminder of his extraordinary work is his legacy to designing, engineering and manufacturing the best possible cars for Australian motorists.⁴²

Barbara Sandford (1891-?) Born Alice Marian Barbara Adams in 1891, the daughter of an Anglican minister in Doddington Essex UK, Sandford was the eldest of four children.⁴³ In 1919 she married John Lindsay Sandford in Essex, he had returned to the UK to enlist with the Royal Artillery rather than join the colonial AIF and in 1920 the couple produced a daughter, mother and daughter then immigrated



Fig. AII.32

Adams Family

the following year.⁴⁴ Being married into the Sandford family and having an uncle who was the High Commissioner of Gibraltar made her acceptance into Adelaide's society, except all was not well and by 1928 the marriage was on the rocks. This was the likely reason Sandford sought an income as it emerged later, during the divorce proceedings, that her husband had for: "five years of habitual and wilful failure to pay maintenance."⁴⁵

Sandford moved in the same circles as Edward Holden and other directors of the Holden Company and was often recorded at the same events. It is not inconceivable that they knew each other and her plight was eased through some employment. Thus, in the late 1920s Sandford became Holden's first stylist, responsible for art and colour in all Holden motor bodies. Sandford appears in the society pages through the 1930s, as does her daughter following her 18th birthday. But it appears both returned to England where Sandford married Lt James Wardle in 1941.⁴⁶ Following this date nothing is known of Sandford.⁴⁷

Valentine Wilfred Stacey (1911-1973) was born to Horace Stacey and Adelaide Gething in Unley, South Australia in April 1911, he trained at the South Australia School of Arts and Crafts with Honours graduating in December 1926 although night classes continued through 1929. At the end of 1926 he joined Herbert Wylie's drawing office as a trainee draftsman. Stacey married Audrey Graham in March 1935 and would become one of Holden's first stylists, working as a layout draftsman through the 1930s until being appointed a technical liaison officer in Detroit, firstly in 1939 and then in 1944 as part of the Holden project, travelling with Hartnett to prepare Holden's submission to the GM directors. In 1947 Stacey moved to Fishermans Bend as the assistant body engineer for CKD (completely knocked down) models (Vauxhall, Chevrolet, Pontiac and Buick).⁴⁸ In 1956 he was appointed the Styling Supervisor over Mathwin and Payze, attending to the administration of the section. When Joe Schemanski arrived as chief stylist from Detroit in 1963, Stacey continued in the administrative roll. He was tragically killed in his office on 8 August 1973.



Fig. AII.33
Holden Ltd

James Kingston Stuart (1905-1988) or King Stuart, as he was to be known, was the son of lawyer Walter Leslie Stuart and Kathleen Kingston. Following his education as a civil engineer, joined Holden in early 1924 as a specification and materials control clerk. Stuart quickly rose through the ranks and by 1928 was the assistant development manager and then the development manager following the merger of GM and Holden in 1931. Stuart was able to integrate the roles of engineering and production engineering thus reducing the lead time from the receipt of an overseas chassis drawing to producing completed body.⁴⁹ Stuart was educated at St Peter's College, Adelaide and married Loulou Ward in 1928, they were divorced ten years later. In 1959 Stuart became the General Manager of the South Australia Holden operations, a position he held until retirement in 1970.⁵⁰



Fig. AII.34
Holden Ltd a

Alfred Leslie (Les) Spooner Jnr (1890-1963) the eldest son of Alfred Spooner, served an apprenticeship at Vout, Chisholm and Son in Hobart with his father, also named Alfred Leslie. Albert Leslie Spooner Snr (1859-1951), after serving an apprenticeship with Williams Kings of London, commenced coachbuilding at Morgan and Sons. Aged 25, Arthur and his wife, Martha, emigrated to Tasmania aboard the SS Panthon, the first steam ship to enter the Derwent.⁵³ Spooner Snr then briefly moved to Ballarat with John Vout, where the Spooner's first son, Alfred Leslie, was born. By 1893 the family had returned to Hobart, Spooner Snr with John Vout and John Chisholm formed a new business partnership, Vout, Chisholm and Co.⁵⁴ The firm quickly gained a reputation for fine buggies and by 1908 moved into automobile body production, producing Roi de Belges bodies for Messrs Webster and Sons.⁵⁵ In 1912 the firm produced Hobart's first motor omnibus with seats for 12 passengers, then continued producing a range of motor bodies to June 1927 when the firm was placed in voluntary liquidation.⁵⁶ Spooner Snr was recognised as a master craftsman in body building but in advanced years he retired due to indifferent health.⁵⁷ Spooner Snr passed away aged 92 on 28 April 1951 in Burnie Tasmania.⁵⁸ Spooner Jnr served a motor body building apprenticeship with his father's company, travelling briefly to London in 1913 to marry his cousin, Agnes Louise Spooner, then returned to Australia, working at one time for Martin & King.

In 1919 Spooner jnr enlisted with the 1st Squadron of the Australian Flying Corp as a mechanic. By 1934 he was employed as a coachbuilder at Ruskin Motor Body builders in Melbourne, under body engineer, J Corser. Spooner Jnr became the firm's chief draftsman and by 1936 was preparing technical articles and drawings for the *Coach and Motor Body Builder*. In 1938 he had the title of chief body designer and in 1940 became the manager of Austin Distributors body works in South Melbourne. During his working life Spooner studied at various institutions including the London Polytechnic, RMIT, Sydney Tech and Hobart Tech.⁵⁹ Following the death of his wife in 1940 Spooner Jnr completed a doctoral thesis, he worked with the newly established truck body company Freighters Ltd (1946) and in 1951 joined the Bishop Bros publishing house as their technical editor.

Dr Spooner was at that time considered Australia's leading authority on bodybuilding and was the only member of British Institute of Carriage Builders who was working in the field in Australia.⁶⁰ In November 1953 a satchel containing eight years of Spooner's research on a proposed car was stolen, Spooner refused to be drawn on how the plans and specification would be used. They were never recovered.⁶¹ Dr Spooner was a member of the Society of Automobile Engineers and died near Marysville, Victoria in 1963 aged 73.⁶²

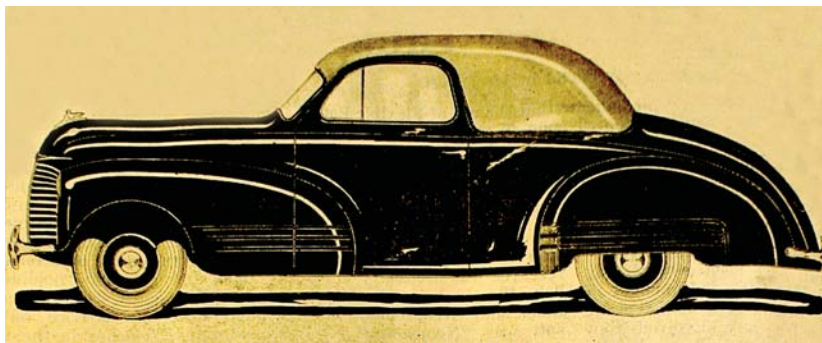


Fig. AII.35
Spooner Family

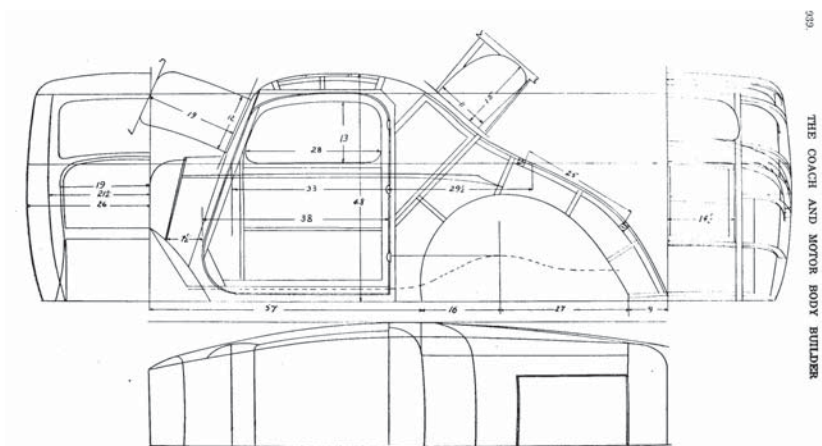


Fig. AII.36 Above top. Custom Coupe drawn by Alfred Spooner in 1948. Above. Austin 8hp draft.
The Coach & Motor Body Builder



Jack Thomson, (1895-1952), mechanic, joined the Australian Royal Flying Corp, served in France and following WW1 established British Motors Ltd (1925), agent for Crossley cars. From around 1934 Thomson became concerned with the high casualty rate of motor cyclists and believed he could design a light simple car that would appeal and offer better protection to motor bike riders.³⁹

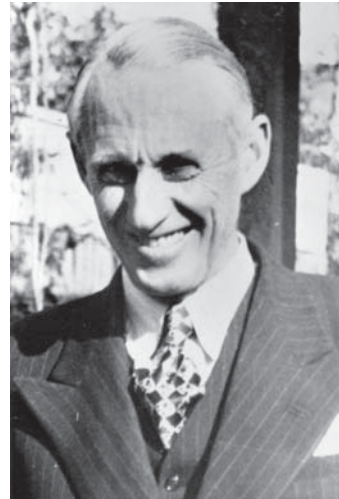


Fig. AII.37

Ivan Hoffmann

By 1937 Thomson considered he could build a light car using the talents of machinist Harold Clisby. He was impressed with Thomson's light weight cycle vehicle. Thomson drafted a 2-cylinder engine design on a plank of wood and took it to Clisby at Litchfield Engineering.

Despite misgivings on the design; the non-removable heads, rotary valves, a crankshaft made from four steel castings and bronze bearings, Clisby machined up castings. After assembly and during the bench test, the engine was found to vibrate severely, then the bearings failed. Clisby redesigned the engine that he said functioned: "Tolerably well".⁴⁰ (Fig. AII.38)

Thomson then embarked on building a body using a design principle developed in Germany by Joseph Ganz, that is a unitary construction of welded steel plates and folded sections that supported the mechanicals and passengers, the major difference being Thomson's engine was up-front. Thomson designed his own gearbox and differential for the car and had Clisby build it using Ford 10 innards. Thomson also fitted his patented water hydraulic brakes to the vehicle using rubber balloons to activate the brake shoes.⁴¹ Thomson and Clisby developed their first vehicle between mid-1938 and the outbreak of war when Thomson again enlisted, serving with the Army on the Adelaide-Darwin road reconstruction.⁴²



Fig. AII.38

Left. Thomson 2-cylinder engine built by Harold Clisby showing the block, manifold and rotary valve.

During the war Thomson applied for both brake and body patents. (Fig. AII.39) He also wrote to the Government advising his intention to redesign and rebuild his first prototype. In March 1945 Thomson when asked by the Government, advised: "There is much to be done before we are in a position to submit a complete plan (for manufacture)."⁴³

When hostilities ended, Thomson approached the Wiles **Ivan Hoffmann**

brothers to take up his car design for manufacture. Thomson built three further cars with Wiles and when the Wiles brothers pulled out of the plan to produce a car in 1949, Thomson formed Small Cars Ltd.⁴⁴ The backer was possibly Arthur Roberts who had financed Thomson's All Australian Motors Ltd (1939). Roberts was a motor financier, the other director of Thomson's company was A S Richards (of H C Richards).⁴⁵ With the additional funds, Thomson commenced his fifth car around 1950, but his death in 1952 left the unfinished vehicle in the hands of his son-in-law, Doug Giles, who completed it. (Fig. AII.40) This last Thomson design car still exists, somewhat modified and powered by a Ford 10 engine.⁴⁶

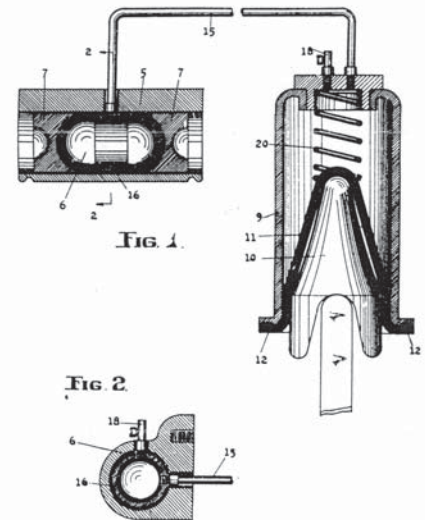
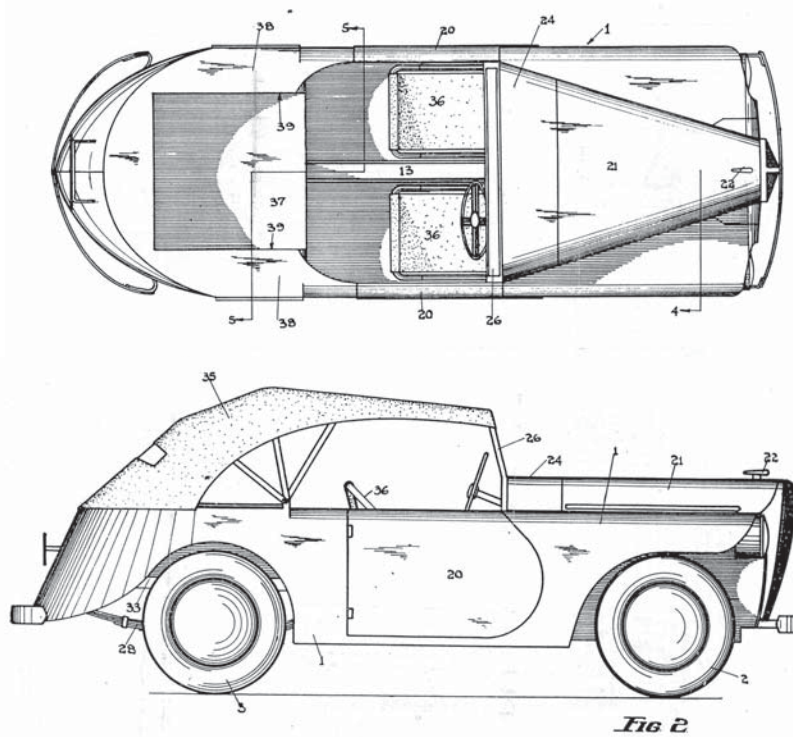


Fig. AII.38 and AII.39
Above. Patent drawings by Jack Thomson of his unitary constructed body. The first Wiles-Thomson prototype follows this design.

Thomson patent



Fig. AII.40
The fifth and last Thomson car completed after his death in 1952.

Ivan Hoffmann

Herbert James Wylie (1883-1935) was born in Strathalbyn, South Australia to Andrew Wylie and Jane Bezor and in May 1904 married Mary Peake, the couple producing five children before his wife died suddenly in April 1919. Wylie had been employed as a young factory hand, with Duncan & Frazer, rising to become the foreman of the coach building workshop. Although untrained Wylie became a proficient motor body builder with an interest in electrical and mechanical engineering. The death of his wife had a profound effect and determined to make a better life for his family he embarked on a self-training trip to Detroit. Wylie's mother took on the responsibility of raising the two youngest and the eldest were boarded. Unable to get a direct entry into America Wylie landed in Canada and obtained a job on the assembly line with Ford Canada. He was recognised as having advanced skills and was moved to Ford's drafting office and learnt the skill of layout drafting. On returning to Australia in 1921 he was immediately employed by Holden.⁶³



Fig. AII.41
Wylie Family

In 1924 he was charged with establishing the firm's first drawing office in the King William Street plan, initially in the toolroom but in 1926 it was set-up in a separate building. By the end of that year Wylie supervised and taught layout drafting skills to five men, all would make a significant contribution to the Australian automotive industry in future years. Wylie unfortunately fractured a rib in 1935, passing away in August of that year at just 52.⁶⁴

Thomas Alvie Wylie (1908-1982) son of Herbert Wylie and Mary Peake, left school at 16 with top marks and with his father's help taught himself drafting before joining his father in 1924 in the new Holden King William Street drawing office.⁶⁵ Between 1928 and 1935 Wylie worked as a body design draftsman responsible for some of Holden's unique body design, the all-enclosed coupé, all steel bodies and single side frame structure. Wylie took charge of the Woodville tooling department, then went to America as part of the Holden car project, returning to run Holden's pre-production and planning areas and eventually becoming the production engineer.⁶⁶ Wylie married Vera Nation in June 1930 and a son, Don Wylie would follow his father to Woodville in 1948, eventually rising to become Holden's chief engineer. Tom Wylie also patented a tyre re-treading machine in 1916, the all-enclosed coupé folding seat mechanism in 1935 and a method for producing banjo axle housings in 1965. Wylie retired in 1973 and passed away in June 1982 aged 74.⁶⁷ (Fig. AII.43)

Oct. 26, 1965

T. A. WYLIE

3,213,531

AXLE HOUSING AND METHOD OF CONSTRUCTION

Filed June 10, 1963

2 Sheets-Sheet 1

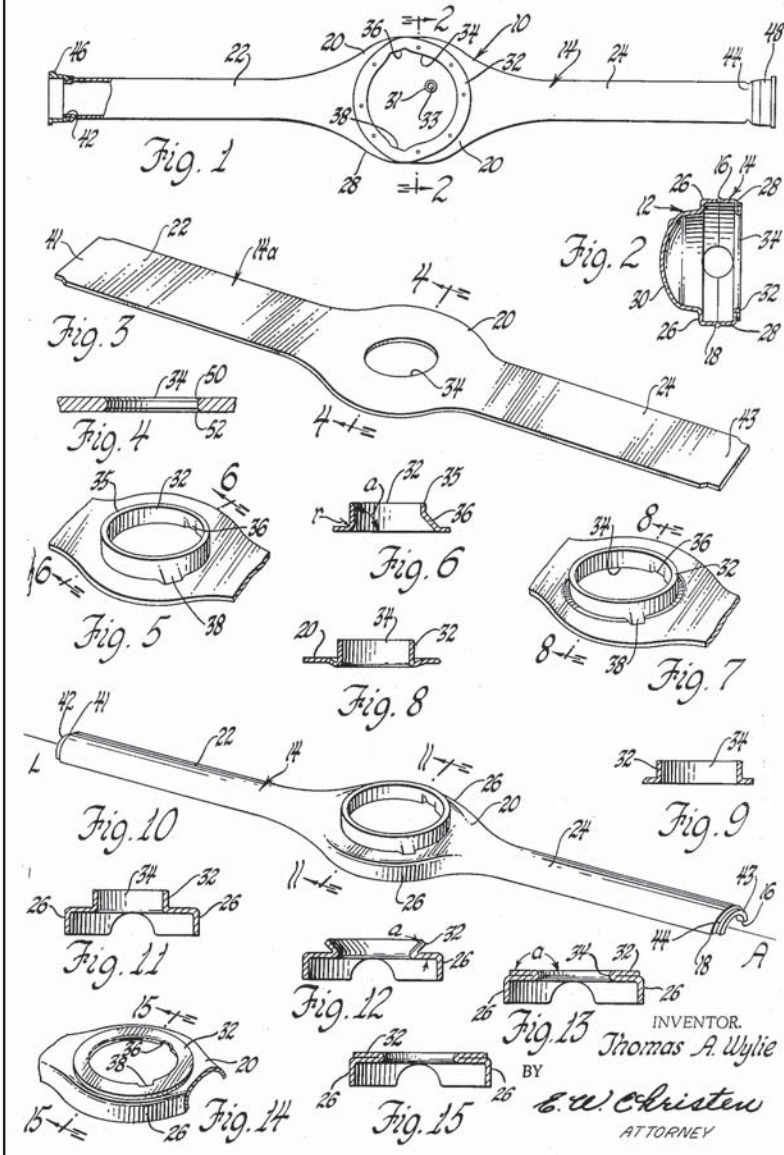


Fig. AII.42

Holden Ltd

Fig. AII.43 left.

Tom Wylie's patent for pressing a banjo rear axle housing three pieces.

US Patents Office

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Lorayne Branch, 28 October 2015, Henry Sutton's Great granddaughter, Ballarat Vic.

John Cook, 15 October 2015, Owner and collector of Charles Innes and Fred Gordon motor cars (Summit and Australian Six) and memorabilia, Sydney NSW, 15 October.

Brenda Fielding, 1 July 2016, Daughter of Jack Rawnsley former GM-H Section chassis engineer and member of the original Holden car design team in Detroit USA, Bendigo, Vic.

Graham Fitzgerald, 30 September 2015, Collector of Summit and Australian Six motor car material, Brisbane, Qld.

Jack Gow, 15 August 2016, Former GM-H Body section engineer (1949-1986), Glen Iris, Vic.

Len Martin, 4 February 2016, Former GM-H Chief Body Draftsman who commenced at the Woodville drawing office in 1933, Noble Park, Vic.

Peter Nankervis, 16 February 2017, Former Holden Stylist and trainee draftsman (1954-2001), Glen Iris Vic.

Leo Pruneau, 6 June 2014, Former Holden chief designer (1976-1984), Woodend Vic.

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Glossary

3-window

Windows counted as two in the doors and one rear.

5-window

Windows counted as two in the doors, two behind the door and one rear.

Ackerman Steering

A geometric arrangement of linkages in the steering of a car or other vehicle designed to solve the problem of wheels on the inside and outside of a turn needing to trace out circles of different radii. wikipedia.org

Buggy 1895-1910

Basically a horse drawn buggy without the shafts, engine under the rear seat, 2-passengers, used high slim wheels with solid tyres.

Cycle car 1910-1920

Very light, usually 2-seater vehicle with simple bodywork and light wire wheels.

Dual cowl

Dual cowl bodies featured a second cowl panel behind the front seat.

High Wheeler 1895-1908

Very early American style that was essentially a 2 or 4-seater rudimentary vehicle based on a horse drawn buggy or wagon.

Island Roof

Prior to all steel roofs (turrets) closed cars were fitted with a material insert made from waterproof "Duck". The material was stretched over a wooden form and padded.

Prop Shaft

The tube that connects the gearbox to the differential. A universal joint is fitted to each end to provide for different angles as the suspension travels up and down.

Quad (Quadricycle) 1900-1904

Early 4-wheeled open vehicle that resembles two bikes joined together, which essentially what it was. A passenger was often accommodated between the front wheels.

Roi-de-Belges 1902-1910

Body style created by the King of Belgium's mistress and featured two single curved front seats highly padded with "tuliped" sides and if a 4-seater, a matching rear seat and "tuliped" sides. (see also Tonneau)

Roadster 1895-1930 (also called a single Phaeton)

Two seater car (American term)

Glossary

Tonneau 1900-1904 (also called a Tonneau Phaeton)

Seating 4 or 5-passengers the first version were rear-entrance (Hind Entrance) Tonnes as passengers entered from the back as the drive chains obstructed the side entrance to the rear. Usually no front doors. When propeller shafts were introduced around 1905 the rear door entry was changed to side doors.

Torpédo 1906-1920

Created by Captain Mausi, the style streamlined the sides and lowered the belt line.

Tourer 1910-1940

Initially an American alternative name for Torpédo but came to mean an open 4-seater car without wind-up windows.

Hot Tubes, Atomisers and Carburettors

The early Otto cycle engines had a rather crude and sometimes dangerous way of delivering and igniting fuel in an engine. Known as “hot-tubes” they provided a tube sealed at one end and bolted to the combustion chamber at the other. Gottlieb Daimler patented a hot tube ignition system in 1883. The tube was heated to red-hot by a Bunsen burner. As the piston rose on the compression stroke some of the mixture of air and fuel entered the tube and was ignited by the hot tube. Timing could be regulated by moving the burner along the tube. If the tube over-heated and melted the driver could suddenly have a flame thrower. Igniters followed hot tubes, these were a tube with a set of electrical contacts at one end, and a trip lever closed the contacts.

Surface Carburettors

These initially delivered fuel as a vapour that formed in a small reservoir attached directly to the combustion chamber.

Abbreviations

ACI	Australian Consolidated Industries
ARMCO	American Rolling Mill Company
AVAC	Australian Volunteer Army Corps
BAC	Bristol Aeroplane Company
BALM	British Australian Lead Manufacturers
BMC	British Motor Corporation
CAC	Commonwealth Aircraft Corporation
CKD	Completely Knocked Down
CNP	Canadian Military Pattern
CSR	Colonial Sugar Refinery
CWO	Canadian War Office
DAFV	Directorate of Armoured Fighting Vehicles
DAP	Department Air Production
GAF	Government Aircraft Factory
GM	General Motors Corporation
GMA	General Motors (Aust) Pty Ltd
GM-H	General Motors-Holden Ltd
GMOO	General Motors Overseas Operations
HMBB	Holden Motor Body Builders
LP	Local Pattern
MGC	Metropolitan Gas Company
OPD	Ordnance Production Directorate
WMC	Working Men's College