



# THE HOLDEN STORY

"The Company has paid, either in Company Tax or Customs Duties or matters of that sort, a total of \$357 million to the revenue of the Commonwealth, and Sales Tax on its products has brought us in another \$700 million. Now that is, I think you will agree, a very substantial equity contributing to the funds available for defence, social welfare or the manifold circumstances that modern Governments have to take to themselves. And so I speak in appreciative vein here today for the contribution which this great Company has made to the prosperous growth of Australia, the well-being of our people and to the strengthening of the nation's industrial force."

The late Prime Minister, The Right Honorable Harold Holt M.P. at the official opening of the Nodular Iron Foundry 10th February, 1967.

## what's in a name?

**HOLDEN** — a name every Australian associates with the motor car. Why the name Holden? The reasons will reveal themselves through the following pages. Actually the name Holden goes back to 1854 when the "horseless carriage" was still only a dream in the minds of imaginative engineers.

James Alexander Holden left England in the true pioneering spirit of many men of his day, but unlike many of his associates, it was not in the search of gold. His father operated a flourishing leather business in England and his son, with the great foresight for which the family became renowned, saw the vast possibilities in Australia and decided to establish himself in Adelaide on the corner of Hindley and King William Streets.

He eventually married, and their first child, Henry James Holden, was born in 1859. A man destined to leave an indelible imprint upon his day and upon an industry then in its experimental stages overseas—the so-called "horseless carriage".

The business progressed and expanded with the times and frequently changed business premises to accommodate the growth. The range of products increased, and were marketed under the trade name of "Holdfast"; they included harnesses, saddlery, travel and sporting goods, gun cases, leggings and a wide miscellany of hardware for the vehicle of the day—the horse.

J. A. Holden retired leaving the control of the firm to his son and a family friend, Henry Adolph Frost, a leading harness and carriage maker, wise in the ways of his craft. The firm's name changed to Holden & Frost and it soon became obvious that H. J. Holden had a flair for business and, for his day, a great appreciation of the effects of advertising and publicity.

In 1854 James Alexander Holden arrived from England, establishing a leather business in Adelaide during 1856.



High above the Holden and Frost Building in Grenfell Street, stood a conspicuous landmark — a full-sized wooden horse, beautifully made.

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The Boer War in 1899 had its impact on Holden & Frost, accoutrements in volume were required, and new factories were established for volume production, including camel packs, saddles, harnesses, leggings and so on. Such was their success in meeting the demands of this war that in 1904 at war's end the firm contributed extensively in the re-equipment programme for the Defence Department of Australia.

Sadly, in 1909 Frost died. H. J. Holden purchased his interests, but retained the now well-established name. By now the Company had become involved in a small way with the motor industry, which although still in its infancy, was beginning to show its face in Australia. Holden & Frost were often called upon to do minor repairs to coachwork and upholstery of these imported vehicles.

The great possibilities of this work were not lost upon the astute men of this Company, but once again war intervened to set another course. Equipment for the First World War of 1914-1918: again leather goods and this time vehicles also were wanted in volume — and quickly.

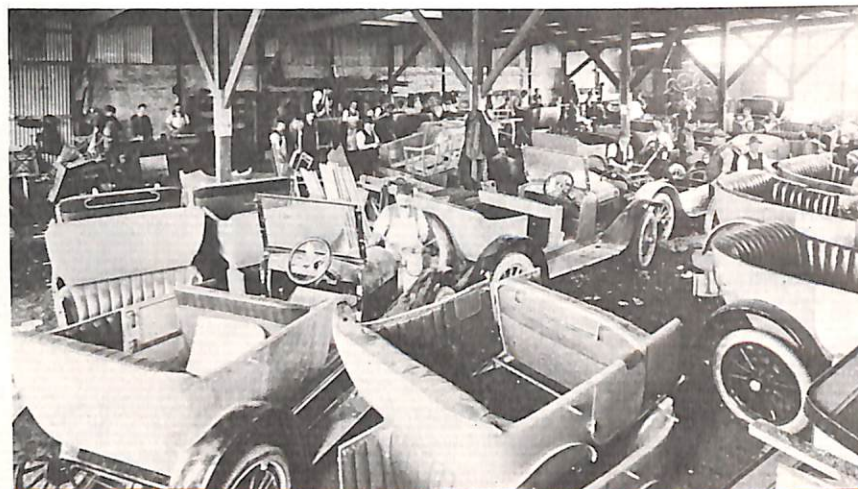
By 1917 the German U-Boat campaign had affected shipping so seriously that the Government ruled an embargo be placed on the import of complete motor cars. Now only chassis would be allowed entry, and the bodies therefore had to be built in Australia.



The machine room of Holden and Frost early in the 1900's.

## growing up

Vehicle assembly at Holden's Motor Body Builders in the mid-twenties.



By 1933 General Motors-Holden's were producing motor bodies in great quantity, incorporating well proven production techniques to keep up with demand.

## the war effort

Under direction from the Fishermen's Bend Plant, shown here under construction, production for 1936-37 swept up to 28,000 units, representing 40 per cent. of the market.



A further modern factory and an administration headquarters were built at Fishermen's Bend, Port Melbourne, and production progressed with great drive and purpose and continued unchecked until the outbreak of World War II.

With the outbreak of war, General Motors-Holden's placed its plants, personnel and all facilities unreservedly at the disposal of the Commonwealth Government. Volume production for victory was the new goal.

Considering Australia's geographical isolation, relatively small population of about 7½ million people, and the immature condition of the secondary industries at the outbreak of war, her subsequent industrial performance has rightly been regarded as phenomenal.

Although the overall volume of General Motors-Holden's war production was in itself creditable, it was the variety of products which possibly set an unprecedented record for one company. They included production of three different engines: Gypsy Major aero engines, naval torpedo engines, Gray marine diesel engines; four different guns: two pounder and six pounder tank attack field pieces, 25 pounder Howitzers and 20 mm. heavy machine guns; major air-frame assemblies for six types of aircraft; eight types of small marine vessels; four types of shell and bomb cases; tents, marquees, haversacks, refrigerators and cool rooms of varying capacities, and vehicle bodies of over 200 models. General Motors-Holden's had truly come of age as a volume manufacturing unit.



A line up of completed 40 ft. workboats outside No. 2 Plant at Fishermen's Bend, Melbourne.

## the all Australian car

The Second World War brought home the fact that Australia was severely handicapped because it was not able to provide its own motor transport vehicle. The necessity that Australia develop a strong range of secondary industries was realised, and a Secondary Industries Commission was established.

On the 22nd March, 1945, the Minister for Post-War Reconstruction threw down a challenge in the House of Representatives . . . "It is the policy of the Government to encourage the local manufacture of motor vehicles. That policy is based on the over-riding importance of motor transportation to the future prosperity and development of Australia. The Government looks to a developing and expanding automotive industry as the keystone that will consolidate the industrial structure built up during the War."

General Motors-Holden's accepted this challenge to build an Australian motor car, and did so without any request for subsidy, tariff protection, import restrictions or other advantages. Also, GMH proposed to produce the car limiting the use of imported components and parts to a maximum of 10% of the list price or 5% of the car's weight.

The decision to undertake complete vehicle manufacture meant bringing Australia into line with the U.S.A., Britain, Canada, Germany, France and Italy—at that time the only countries which had been able to manufacture motor vehicles both economically and on a qualitative and quantitative basis.

Motor vehicle manufacture has long been a yardstick by which a nation's growth, internal stability and industrial strength can be estimated. So GMH was not only declaring its faith in Australia and in her future, but it was proposing to translate into fact the long held national belief that given the know-how, tools and equipment, Australia could build complex products equal to the best built anywhere in the world.

GMH's decision meant the launching of one of the most significant and most complex design and manufacturing projects in industrial history and answers had to be found to a multitude of economic and physical problems.

It was one problem to assemble the motor car as had been done in the past, but it was quite another to manufacture one.

Since this was to be a car designed and built specifically for Australia, the first step was to survey what the Australian motorists wanted most in appearance, dependability, fuel consumption and performance.

From this survey emerged the design of the first model Holden.

Meanwhile, GMH engineering and production personnel were undergoing special training in Australia and overseas, new buildings were designed and erected, machine tools were procured and installed, and other preparatory work completed for a vast and complex undertaking never before attempted in Australia. Three prototypes were built and tested, then a fourth and a fifth. Because no test track was available in Australia at that time, it was necessary to select and lay a course close to Melbourne. This course was 86 miles long and included every type of road condition which a car might reasonably be called upon to meet. These cars were driven over this track day after day under the strictest of conditions. Mileages covered per car per day ranged between 200-600, and it is estimated that in this type of driving, each mile is equivalent to four miles of ordinary driving.

Exactly 79,129 miles later, the fifth car was declared suitable for Australian conditions. The test cars had covered 236,750 miles to ascertain what these conditions were and what modifications were needed to combat them.

This prolonged road testing of a car under actual conditions caught and held the interest of the Australian public.

Tools, dies and other specialised equipment for volume production were then completed. One of the most difficult tasks in the whole project was that of establishing local suppliers for the wider range of materials which go into the manufacture of a motor car.

GMH went out to the suppliers and provided them with technical advice and assistance, including full use of the laboratories and testing equipment of the Engineering Department. This assistance enabled suppliers to initiate many new types of manufacturing techniques to increase the quality and volume of existing techniques to ensure that volume production could be maintained.

In all, GMH spent \$17 million in giving birth to the first Australian designed and produced motor car.

It was indeed fitting that the then Prime Minister of Australia, the late Right Hon. J. B. Chifley, formally introduced the first Australian car to the nation and proclaimed the name selected for it.

This he did on 29th November, 1948, before a large audience in the Fishermen's Bend Plant, Victoria.

From a survey of Australian conditions and the Australian motorist's requirements emerged the design of the first model Holden.



Production of the first model Holden at the Fishermen's Bend Plant in Melbourne.



The then Prime Minister of Australia, the late Right Honourable J. B. Chifley, introducing the first Australian car to the nation.

## giant strides

The acceptance of Holden by all sections of the community, in the cities and in the country, was immediate and beyond all expectations. Holden production began at 10 vehicles per day, thus it was only possible to produce 163 Holdens in the remainder of the year 1948.

It was soon evident that the original planning to build 20,000 Holdens per year would have to be adjusted. The daily production did move upwards slowly but surely and from the initial ten per day in 1948 an output of 100 per day was achieved in 1951. However, the demand still exceeded capacity. It soon became obvious that extensions to the manufacturing assembly facilities were essential and so the Company began a series of expansion programmes which were to become a way of life with GMH as it endeavoured to satisfy the ever-growing demand for its products.

The first of these, a \$22 million expansion programme, was announced in November 1952 and in 1953 the second Holden, the FJ, was introduced onto the market and a panel van added to the range.

Part of a further \$43 million expansion programme announced in 1955 was the establishing of a new plant at Dandenong, which was completed in 1956—the year of the FE Holden.

Two years later the fourth Holden, the FC, made its debut and in 1959 the new Elizabeth body hardware plant began production.

The FB Holden was introduced in 1960, followed by the EK in 1961. Expansion was progressing rapidly and sales were ever increasing, so much so that by 1962 the millionth Holden, an EJ, rolled off the production line at the Dandenong plant. As if that was not a great enough achievement for one year, to top it all the luxurious Premier sedan was launched on to the market.

The pace certainly was not slackening. In 1963 the EH was introduced and a new \$30 million expansion programme announced; Elizabeth's new paint shop and trim assembly plant commenced operations, to be followed in 1964 by trim fabrication.

Also during that year, a further \$48 million expansion programme got under way. The years to 1967 maintained this phenomenal growth rate. The HD was introduced on February 15, 1965, and also during that year the first component was cast at the new 135,000 sq. ft. mechanised grey iron foundry. 1966 saw the first cars rolling off the Queensland Acacia Ridge Assembly Plant, and the arrival of the popular HR.

The nodular iron foundry was opened in February 1967, and in May the electro-plating plant at Wood-

ville. In November, 1967, it was announced that GMH planned to become the first Australian car company to completely manufacture its own automatic transmissions. The manufacture of automatic transmissions will involve completely new technological skills and processes including advanced aluminium die casting techniques, and GMH will spend \$16,400,000 to provide new facilities and equipment. The completion of this latest project brings GMH's total investment in plants and facilities in Australia since the Holden project began in 1948 to more than \$420,000,000. Certainly the most significant development of 1967 was the introduction of the highly successful sporty Holden Torana.

It is indeed a fantastic growth rate in a period of less than 20 years.

It is often quite difficult to appreciate just how much a company as progressive as GMH can affect the overall economic environment and general industrial development of Australia. Australia is now depending more and more for her economic well-being upon the manufacturing industries.

The automotive industry provided much of the impetus for Australian industrialisation in the post war era, and in fact, the introduction of the techniques of large volume, high quality production into Australian industries owes much to the establishment of local vehicle manufacture in 1948.

GMH now has more than 4,000 Australian supplying companies, and these companies are in effect indirect shareholders. In fact, many of these companies came into existence to meet the needs of Holden manufacturing operations.

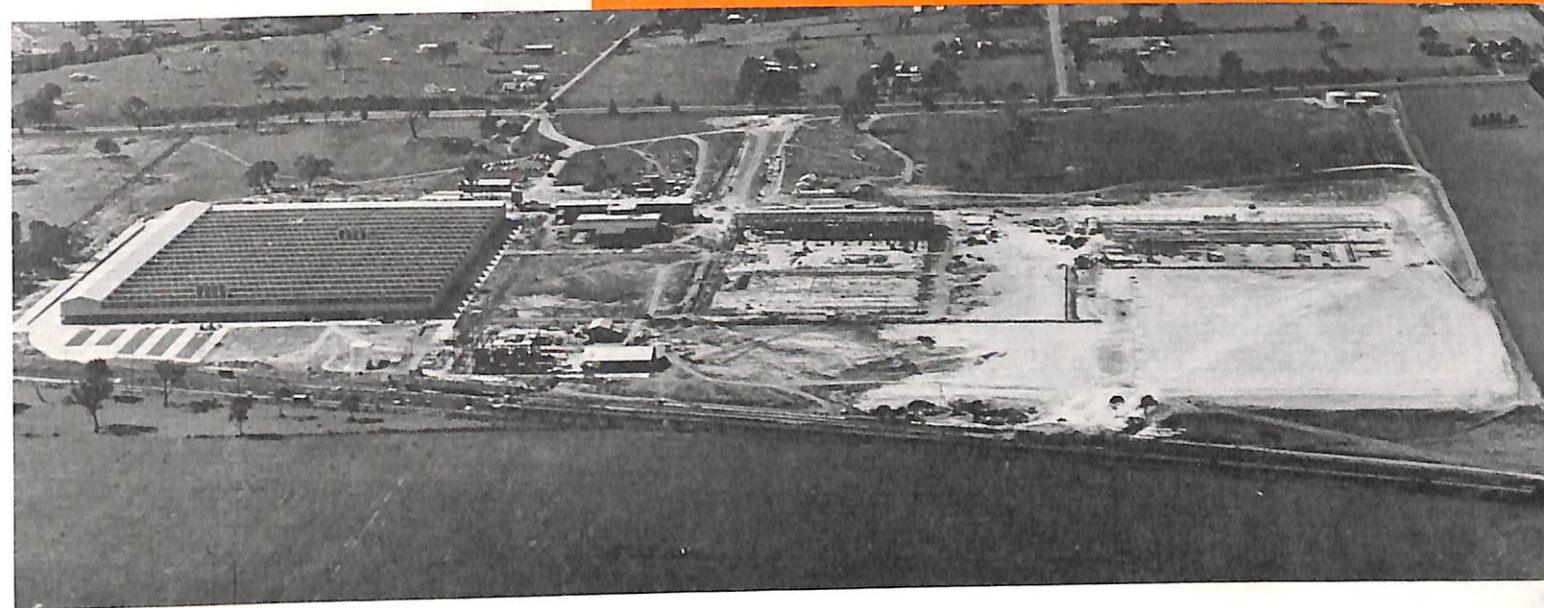
Total purchases from Australian suppliers since 1948 amount to over \$2,000,000,000. There are more than 22,000 men and women employed by GMH throughout Australia and it has been estimated that 35,000 men and women are engaged by suppliers to provide materials, parts, components and services for GMH. It can readily be appreciated that this is of considerable economic significance to the nation.

So far, this book has dealt with the origins, history and continued growth of General Motors-Holden's. Let us now look at the Company as it exists and operates today. One point needs making; between the time this has been written and the time it is being read, further growth, further changes, will have taken place. No book like this could ever be 100% up to date. If it were, the Company which is its subject would have stood still—and that's something GMH has never done.

The millionth Holden, one of the popular EJ series, rolled off the production line at Dandenong in 1962.

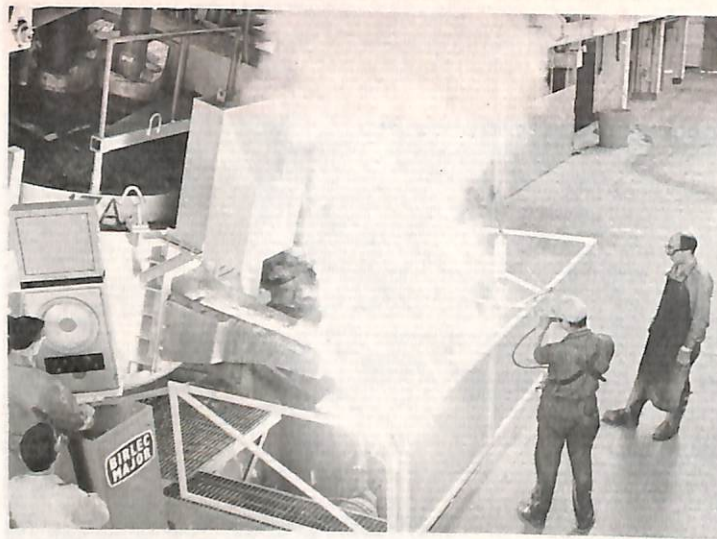


Part of a 43 million dollar expansion programme announced in 1955 was the establishing of a new plant at Dandenong which was completed in 1956.



## GMH plants in Australia

The \$6 million Technical Centre, Fishermen's Bend, was opened on June 10, 1964. The centre employs over 900 stylists, designers, engineers, draftsmen and skilled technicians.



Pouring Nodular iron at a Fishermen's Bend Foundry. Here GMH cast crankshafts and front wheel hubs for Holden.

To attempt to describe in detail the nine plants established throughout Australia would make this chapter incredibly long and rather bewildering. This is a good opportunity, though, to point out the plant locations and how they contribute to the GMH organisation as a whole.

There are plants in every mainland state of Australia. In Victoria at Fishermen's Bend, a ground area of 103 acres and a building area of 2,322,246 sq. ft. houses the Head Office, the Technical Centre, Holden's engine and mechanical manufacturing plant, and the foundries which pour the engine blocks and allied components. At Dandenong, Victoria are located Body and Vehicle Assembly plants together with Frigidaire, Idec and NASCO Divisions.

GMH started manufacturing Frigidaire household refrigerators in 1940, and the range now includes refrigerators, cooking appliances, clothes washers and dishwasher/dryers.

Idec, the power and industrial equipment division of GMH, provides GM diesel engines, Holden and Bedford engines for numerous applications, Allison torqueomatic transmissions and various ball and roller bearing and electrical equipment.

NASCO — short for National Automotive Service Company — is the GMH division responsible for maintaining a constant availability of some 58,000 different parts and accessories to meet the requirements of GMH vehicle owners in the domestic and export markets.

The GMH Euclid Division supplies heavy duty off-highway earth moving equipment for national development projects which include crawler tractors, scrapers, rear dump trucks and front end loaders.

The DISCO Division, which manufactures Holden electrical components and AC Spark Plugs, is also situated in Victoria on a small 1½ acre site at Port Melbourne.

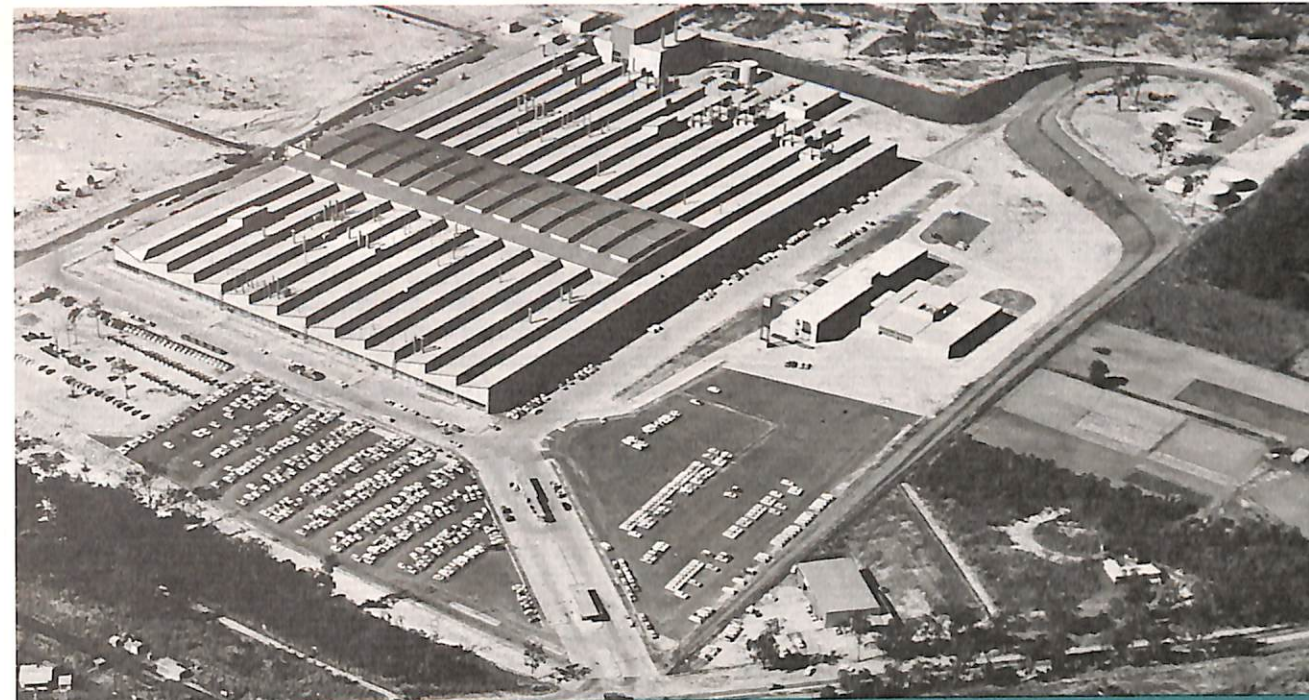
The largest metal stamping plant in the Southern Hemisphere is located at Woodville in South Australia and another metal stamping plant is located at Elizabeth in South Australia together with a body hardware manufacturing plant, a body and vehicle assembly plant and a body vehicle trim fabrication plant.

All the sheet metal components in the Holden car are manufactured in South Australia and transported by road, rail and sea to the assembly plants in other states and to the plants where Holden is assembled abroad in New Zealand, South Africa, the Philippines, Indonesia, Trinidad and Pakistan.

There are body vehicle assembly plants at Pagewood, N.S.W., Mosman Park, Western Australia, Acacia Ridge, Queensland, Elizabeth, South Australia and Dandenong, Victoria.

In total these plants cover 1,149½ acres but to this should be added the 2,167 acres of the Lang Lang Proving Ground. Now in its tenth year, the Proving Ground has logged more than 11.5 million miles of vehicle testing. It is a vital part of GMH's Australian Design and Engineering facilities and is used to prove safety, reliability, durability and performance.

Despite the severity and exacting nature of these tests not one single lost time accident has occurred since the Proving Ground started operating in 1957.



Acacia Ridge, Queensland, is the newest GMH Body and Vehicle assembly plant. It is close to Brisbane and serviced by a railway spur line which enters the main plant building.



Woodville, South Australia, where tools, welding fixtures and dies for metal stamping and body building are produced. Here also GMH produce body components and plate Holden bumpers and other parts.

## export Holden

The Holden export story has been one of initiative and vigour. It began in 1954 when GMH, although unable to meet the domestic demand for the popular FJ series, decided to embark on an export programme without further delay.

At this time, it became obvious to both the Government and the responsible business leaders that Australia's rate of export earnings of manufactured products would have to be substantially increased if it was to develop as a nation.

This was the atmosphere in which GMH took the major decision to enter their products in the export field.

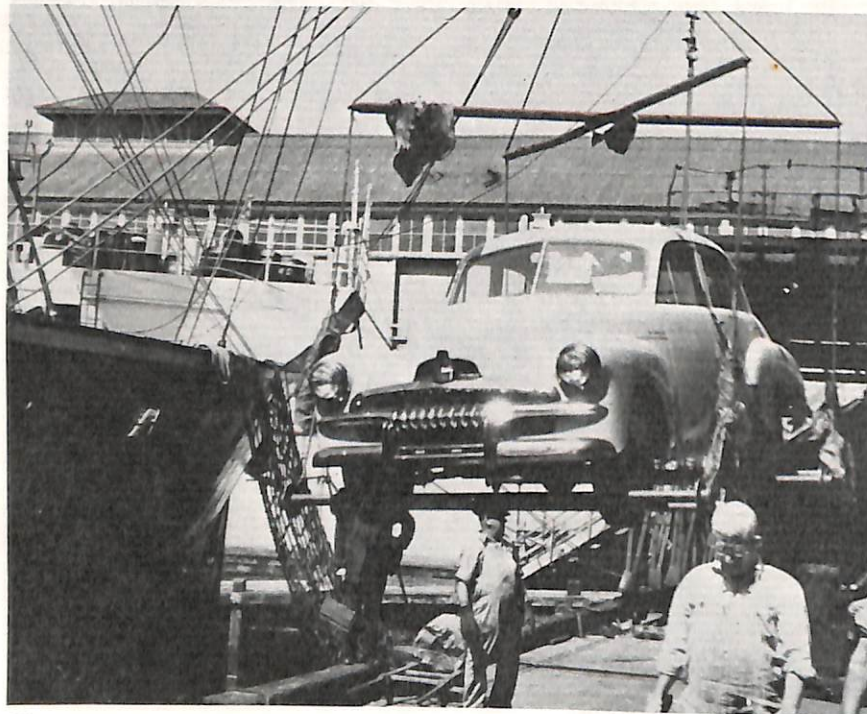
New Zealand, because of its close association with Australia, was the natural first choice as an export market, and in November 1954, a consignment of 15 fully assembled Holdens was exported to New Zealand to test the local market. So enthusiastically was the product received that shipment soon reached the rate of 100 vehicles per month.

A further stage in consolidating New Zealand as an export market was reached in 1957, when General Motors New Zealand became equipped to assemble its own Holdens from crated components (known as CKD Shipments).

Boxing vehicles for export is a big story in itself and is a major activity of the Woodville and Fishermen's Bend plants. Chief reasons for the success of these CKD units is the cost saving they offer by considerably reducing shipping space and hence freight costs. Also the use of local material and labour resources by the importing country brings reductions in import tariffs. It is very expensive to export complete vehicles to many countries; and in some cases only vehicles with a certain content of local labour and/or materials are allowed in.

The basis of the CKD system is a 'series' of wooden crates that between them contain the ingredients for building a number of vehicles. To watch these large crates being loaded on to road vehicles at the manufacturing plants is to enjoy an interesting lesson in geography — and also to realise at first hand that GMH vehicles are bought by people in so many different countries.

Pioneering shipment of export Holdens began with FJ models which left Australia for New Zealand during 1954.



Since Holden export began in 1954 the marque has achieved great popularity in overseas markets. Today Holden is shipped to 69 overseas territories and is one of the nation's biggest earners of overseas currency.

Today, more than four-fifths of all Holden exports to New Zealand are assembled in New Zealand, and that nation is still Australia's major market for Holden.

From the beginning it was accepted that the product would need to be extensively promoted in export territories, particularly so in the early stages. Holden was a completely new automobile in export territories, not just an established make given a face-lift. Holden was new from the ground up, new in name, and new in concept.

There were no bench marks of previous performance by which potential buyers could compare Holden with other well established makes. However, it appeared that the "word" about Holden was obviously getting around, for by 1956, Malaya, Singapore and Thailand were buying the "new-look" FE series. It was found that the rugged road conditions of these countries had no more effect on Holden than the outback Australian roads. By the end of 1956, the New Zealand success story was beginning to unfold in the East and elsewhere, with Holden selling steadily in Thailand, Singapore, Malaya and the three North Borneo states.

After 1956, progress was rapid. 1957 saw distributors established in 19 countries, while 8 new markets were won in 1958. Local assembly of Holden commercial vehicles entered the scene in 1959, when facilities were established by a distributor in Indonesia. Catalogues were printed in an increasing number of foreign languages as Holden penetrated further afield.

It was becoming increasingly obvious that the time had come for GMH to build left hand drive models for export. This was achieved in August 1960, and the following month Holden made history as the first Australian-built car to earn American dollars when the first left hand drive Holdens were exported to Hawaii.

In 1961, Holden again made export history by becoming the first Australian car manufacturer to penetrate the West Indies. Holdens left Australia for Trinidad and the neighbouring island of Tobago. Today, Holdens are shipped to 69 export territories, many with special accessories such as kilometre speedometers. In Thailand, Singapore, Malaysia and Iraq,



Shipments of Holden mechanical and body components are made to several of the 69 overseas territories. Holdens are locally assembled in New Zealand, South Africa, Indonesia, Philippines, Trinidad and Pakistan from Australian produced components.

Holdens are used extensively as police cars, and are fitted with Australian made sirens, blinker lights or warning bells.

Holden is now assembled in New Zealand, South Africa, Indonesia, Trinidad, Pakistan and the Philippines.

In mid-1966 GMH added a new phase to its export programme by securing export orders from Vauxhall in England and Opel in Germany for torque convertor components for automatic transmissions. This component represents a technological advance in Australian manufacture and has important implications for the national economy.

Yet another export market has been opened to GMH with the opening of the Nodular Iron Foundry at the Fishermen's Bend plant in Victoria. GMH received export orders for nodular iron castings from this foundry, and the first shipment left for Vauxhall Motors in England during 1967.

GMH recognises Australia's constant and pressing need to export in order to maintain existing living standards, and Holden export orders will continue to be given top priority.

No longer is GMH simply saving the foreign exchange which was spent on imported cars — although this, in itself, is a valuable contribution to the national wealth. Today it is making a positive addition to export income and, by the quality of its products, is increasing the prestige overseas of Australian manufacturing industry.

Tropical Fiji is one of the many Pacific territories which receive Holden exports. This EJ Station Sedan model was pictured soon after export began to Fiji.



## how the car is manufactured

Holden motors first breathe life above test beds in the GMH engine plant at Fishermen's Bend. Here timing and other adjustments are made before shipment to vehicle assembly plants.

Automobile manufacture is a fascinating subject; let us now look at some of the more interesting aspects of vehicle production.

There are four basic manufacturing processes involved, casting, stamping (which includes forging), machining and assembly.

Castings are produced by the pouring of molten metal in moulds. Stampings are produced by the press-forming of sheet metal. Machining is performed by the cutting of solid metals to shape and assembly involves the marrying of castings, stampings and machined parts to form the finished vehicle.

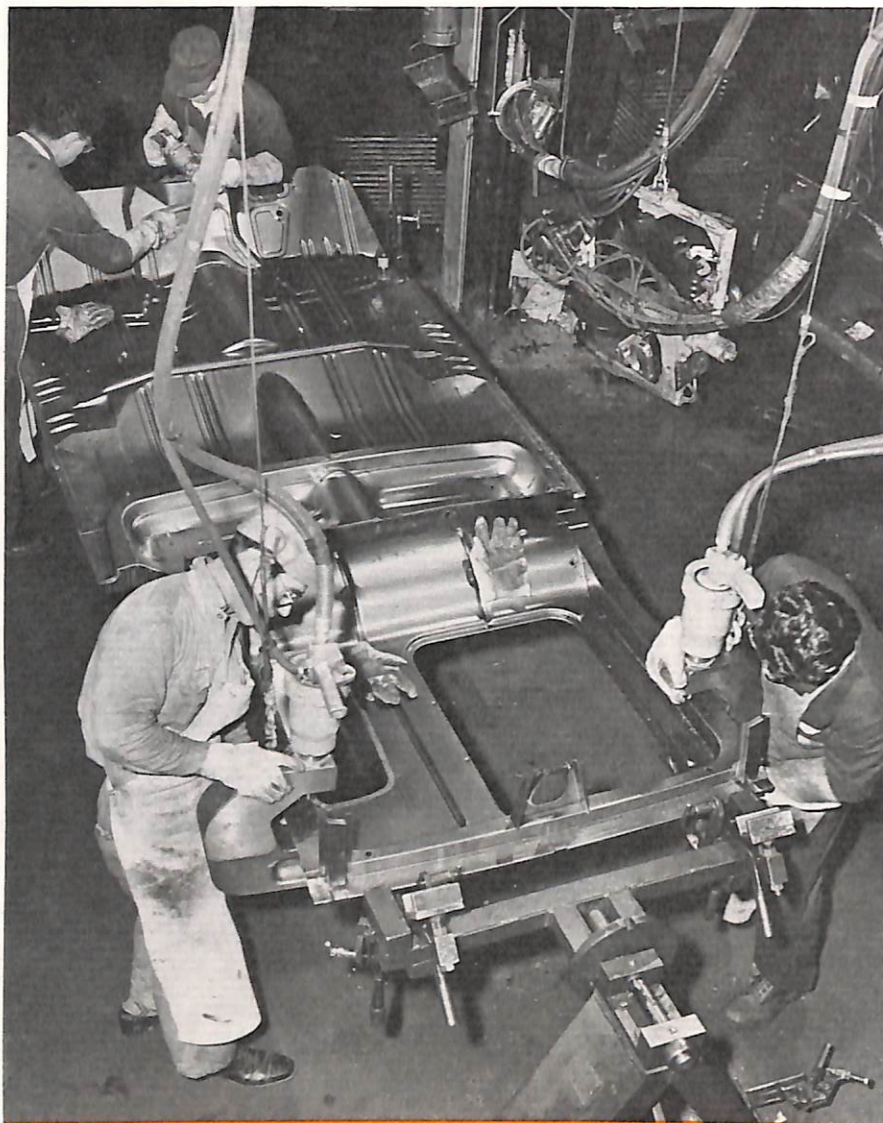
Hundreds of tons of metal are poured daily in the mechanised foundries at Fishermen's Bend, Melbourne, which supply the grey iron castings for Holden production.

The new \$6,800,000 Nodular Iron Foundry, the first of its type outside North America, casts crankshafts and front wheel hubs for Holdens. Nodular iron is a relatively high carbon alloy which can be cast to shape to produce parts stronger than grey iron.

Stamping, second of the basic manufacturing processes, is performed in the press shops at Woodville and Elizabeth in South Australia where sheet metal stock is shaped into such body components as roofs, engine hoods, doors and fenders also such mechanical components as valve rocker covers, engine sumps, front suspension components and rear axle housings.

The third basic process, machining, includes the cutting to shape of forgings, castings and bar stock materials into such components as cylinder blocks, crankshafts, pistons and gears. These operations take place in the various machine shops at Fishermen's Bend and Dandenong, where the components are assembled to form finished engines, transmissions and front and rear axles.





Resistance welding a Holden floor pan at one of the GMH assembly plants.

All these pressed and machined components and assemblies are then delivered to the assembly plants at Acacia Ridge, Queensland; Pagewood, New South Wales; Dandenong, Victoria; Elizabeth, South Australia and Mosman Park, Western Australia.

The pressed body components are welded together to form strong, rigid body shells. A car body shell is really made up of six major units, the floor, two sides, front and rear ends and the roof. These major units are themselves assembled from a number of smaller pressings prior to reaching the main body assembly fixtures.

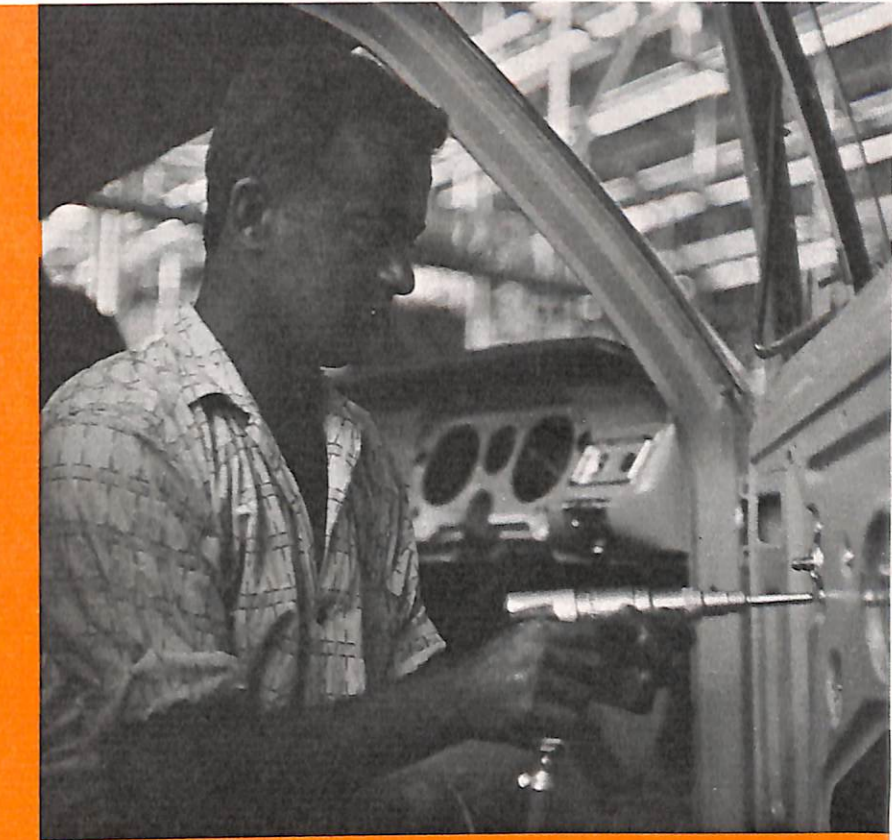
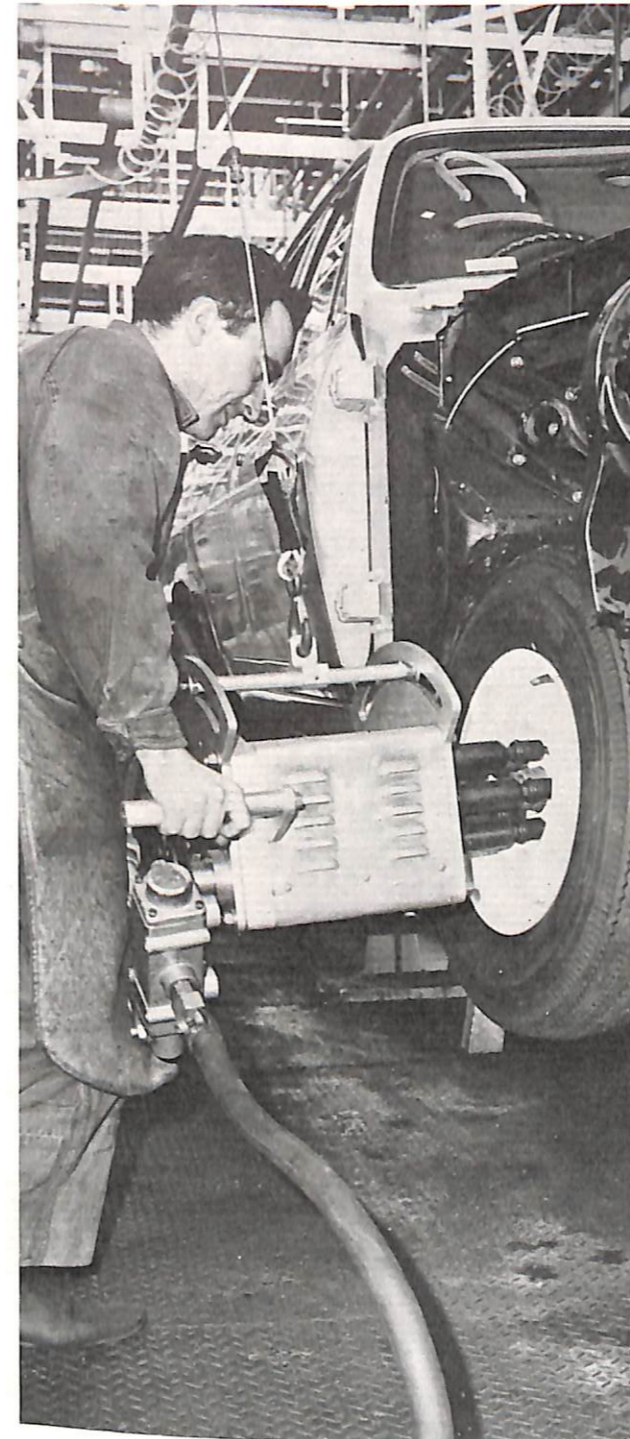
The assembled body is then solder loaded and metal finished prior to entering the paint shop. The paint is baked as the conveyor carries the body through the drying ovens.

The body shell now collects its furnishings. The long conveyor carries the body shells through a large number of "stations" where different items are fitted, from seats to door handles and window glasses.

The final stage in producing the complete car is the installation of the mechanical items — the engine, transmission, front and rear axles and the steering gear.

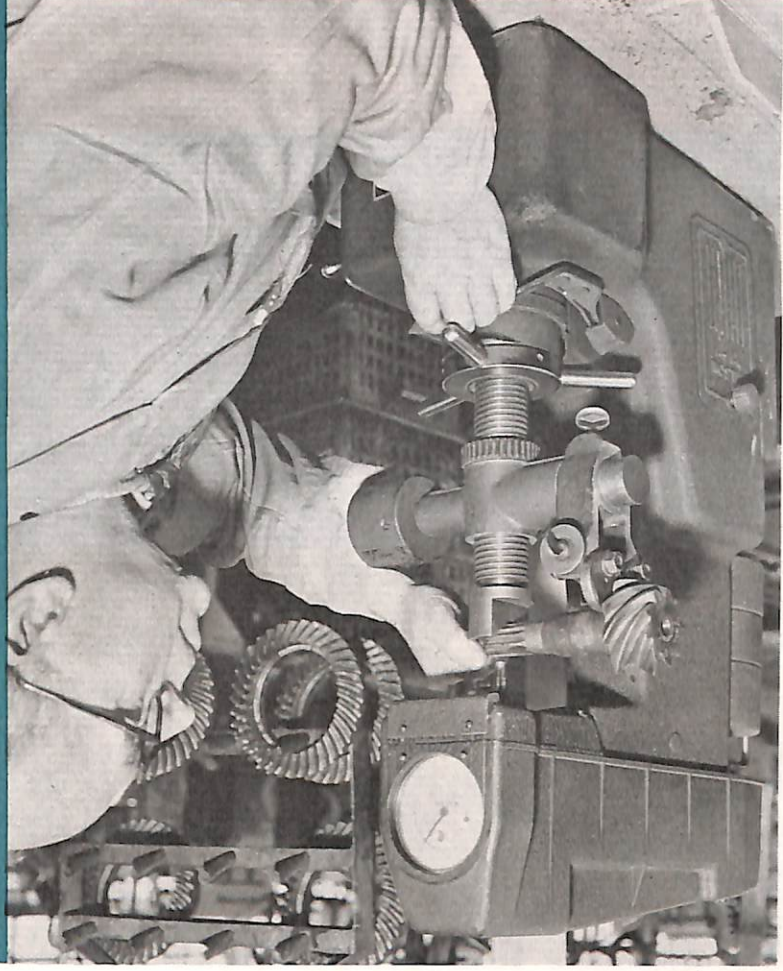
Further minor operations are completed and the car is then driven off the assembly line under its own power for final inspection and delivery to the dealers and distributors.

At all stages of production, the men of Quality Control Department are stationed to ensure that the required standards of accuracy and quality are being maintained.



Pneumatic nut runner tightening window assembly at one of the GMH assembly plants.

Multi-Spindle nut runners tighten Holden wheels on a GMH final assembly line. Vehicles move along a conveyor line as parts are progressively added.

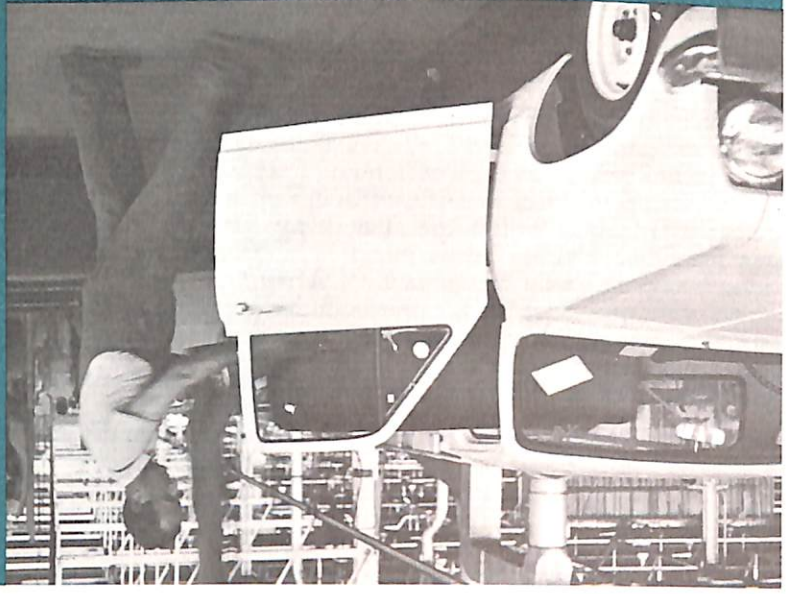


Differential pinion being hardness tested at Fishermen's Bend plant. Holden motors, transmissions, front and rear axle assemblies and other mechanical components are produced at the 103 acre Fishermen's Bend Plant.

Electro-plating wheel hubs and body hardware at the Woodville Plant.

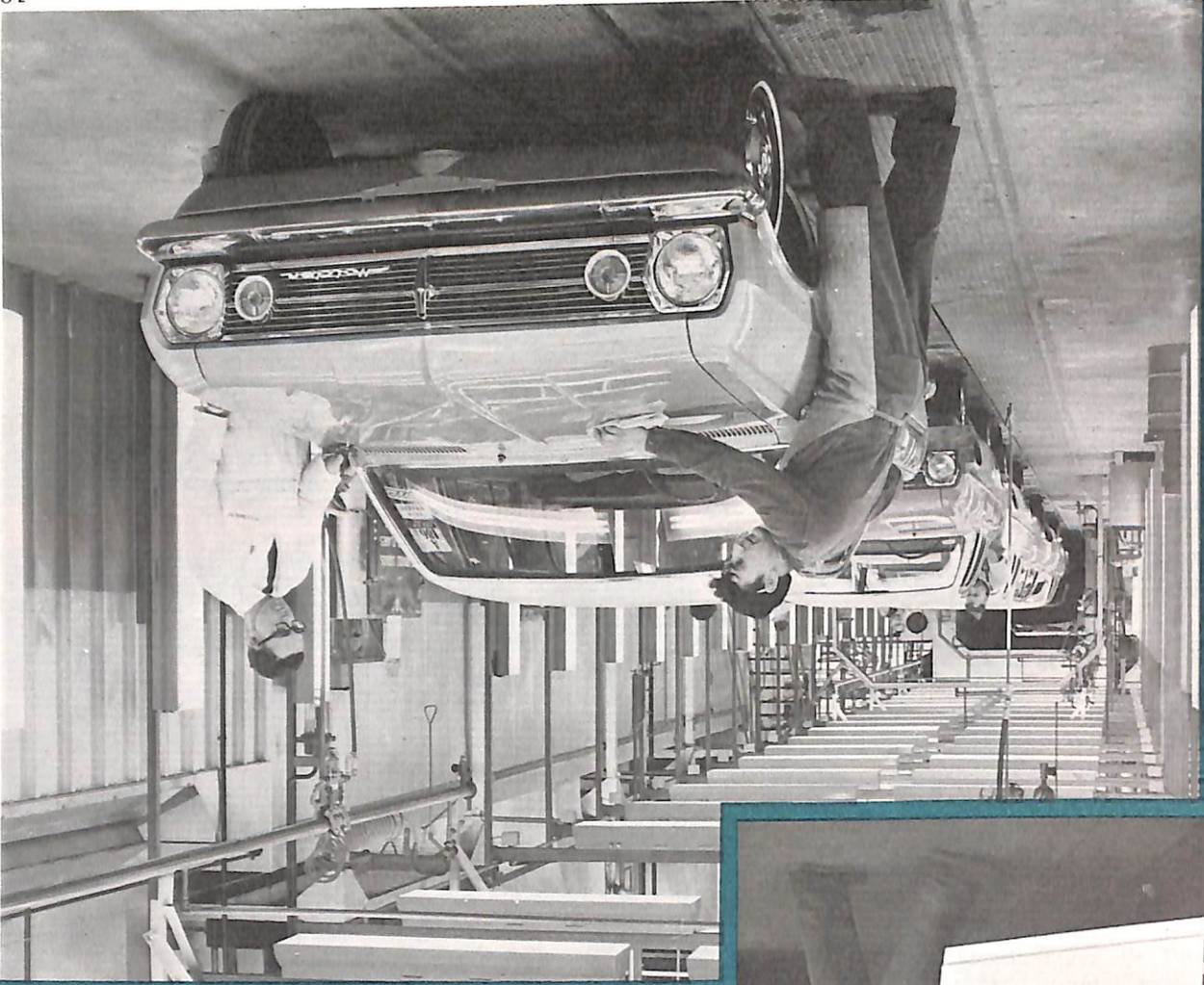


Arc welding in the early body building stages.



A highly mechanised "Helping Hand" gently eases a Holden front seat into position on a GMH assembly line.

Critical inspection of Holden's gleaming paintwork is carried out under banks of brilliant lights in GMH vehicle assembly plants.



## towards tomorrow

On June 10, 1964, the new Technical Centre at Fishermen's Bend was officially opened. The Technical Centre is the only one of its type in Australia and incorporates facilities in depth for research, product design, engineering and testing. Ever since the first Holden in 1948, Holden has been 100% designed in Australia. Australian design is vital, not only does it mean that the car is more suited to Australian conditions and preferences but it also allows flexibility in design and total independence from any overseas programme.

Also the ability to design is an important national attribute and a prerequisite to full industrial maturity.

Many of the men and women employed in the Technical Centre have some form of advanced qualifications in mechanical, electrical and chemical engineering and a variety of allied skills. This reservoir of technical skills constitutes a vital national asset, particularly in regard to the nation's defence.

Basically, the Centre divides into two main sections: Engineering and Styling. Each of these in turn can be roughly divided into two more main sections: Engineering Drawing Offices and Workshops; Styling Design Studios and Styling Workshops.

Let us take styling first, as it is logical to think of a car starting in the design studios and later progressing to the Engineering Section to be turned into a complete, working, running vehicle.

The Styling Designers in the studios put their ideas on to paper, then turn them into scale models. The Styling Department is responsible for the form, colour and character of all visible internal and external parts.

Among the reasons for Holden's popularity over the years is the fact that, alone among the cars on our roads, Holden is designed specifically for Australian conditions. The style must incorporate the wealth of information collected by Sales Department's Customer Research Section which finds out what Australians want their cars to look like.

After taking into account all these considerations, the skilled modellers study the chosen outline and a full sized car is hand moulded in clay on a wooden frame-work. These full size clay models are made up from drawings produced by the studio draughtsmen under the direction of the designers.

From casts of the clay model, a mould is taken and reproduced in plastic reinforced with fibre-glass. This is almost the finished product apart from engine and mechanical components. It glistens with new paint-work, chromium, glass windows, operative doors, boot-lid, bonnet, wheels and tyres. Instrument panel and pedals are fitted and seat upholstered. The car in every detail is indistinguishable from "real".

Meanwhile, draughtsmen and development engineers get together to produce detailed drawings corresponding to the accepted styling and to design the mechanics of the new models. They too begin on paper, producing thousands of drawings which are subsequently translated in the engineering workshops into sheet metal parts, engines, gear boxes, axles and so on, and eventually into complete hand built prototype vehicles for further development.

The building's ground floor houses the big rig test laboratories, where hundreds of exacting tests are made with the purpose of seeing how much punishment the vehicle's parts and components can take. Tests are conducted not only on GMH manufactured components, but also those made under demanding specifications by the 4,000 companies within Australia who act as suppliers to the Company.

GMH was the first Company in Australia to build its own Proving Ground. Proving Grounds within the country of manufacture are essential if the car is to be kept truly a local product.

The prototypes are subjected to the most exhaustive testing at the 2,167 acre Proving Ground at Lang Lang. For 24 hours each day, six days a week, Holdens are driven in a miniature round-Australia trial over the worst roads, outback tracks, mud and water stretches and every kind of test imaginable.

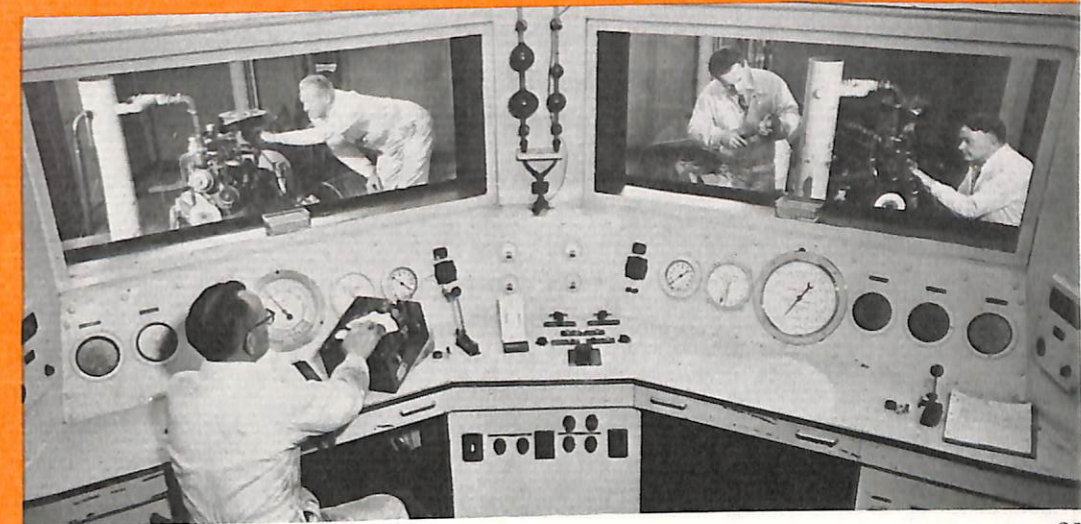
Further evidence of GMH's commitment to research is the decision to construct a \$750,000 Safety Design Test Centre at the Proving Ground.

This centre will be the first of its kind in the Southern Hemisphere, and will incorporate some of the most advanced equipment yet devised for safety testing, including an impact sled, a crash barrier and a special tyre testing machine.

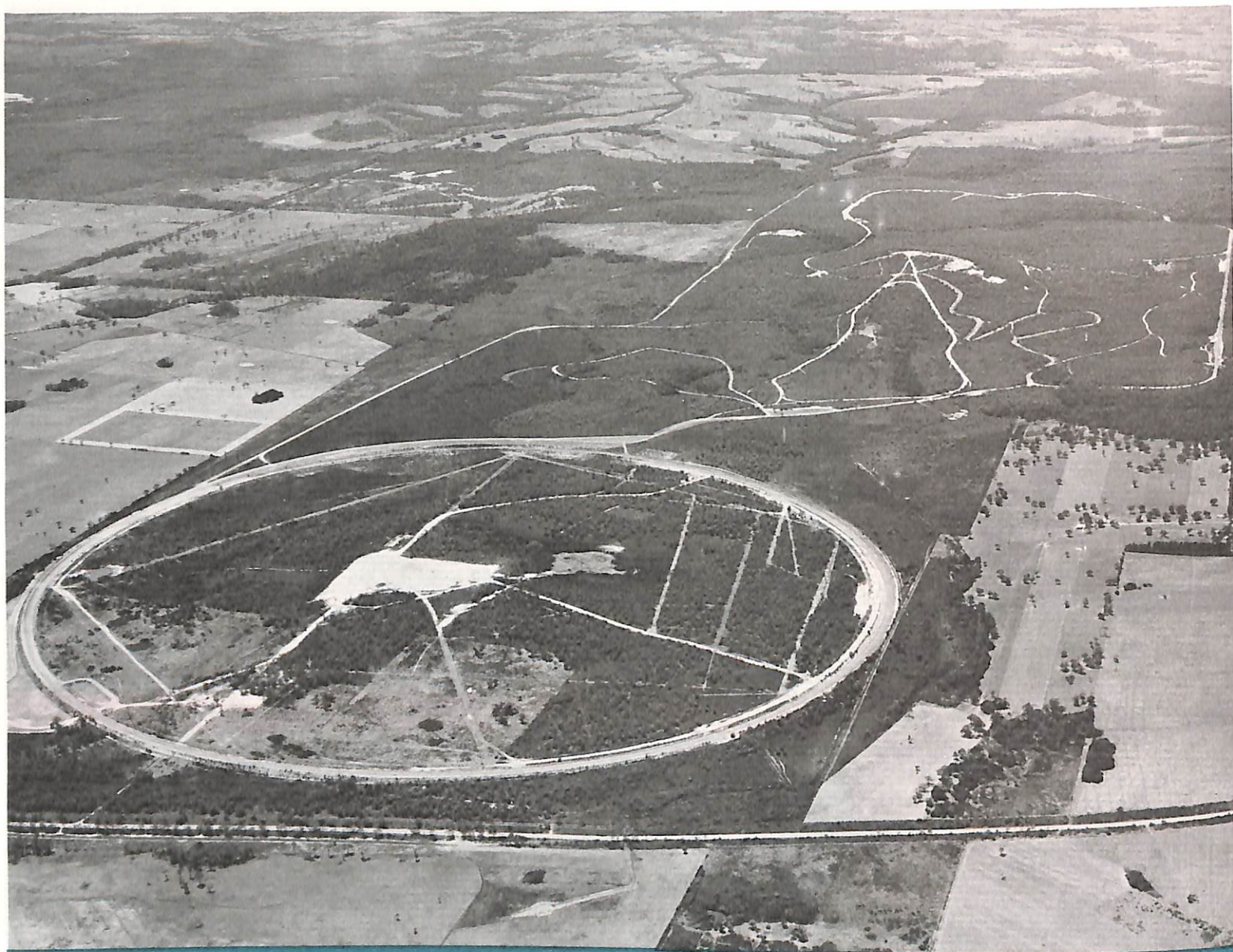
Finally, at the end of a very long and complex period of development, testing and refining, the new design is passed for production.



Holden styling is created in the \$6 million GMH Technical Centre at Fishermen's Bend. Highly finished wood and clay models follow artist's renderings to test new ideas.



Engine Dynamometer cells in the \$6 million GMH Technical Centre at Fishermen's Bend. Holden motors are proven under closely controlled conditions and under varying loads.



Dominating the foreground of the 2,167 acre GMH Proving Ground at Lang Lang, is the banked three mile circular speed loop. This is linked to a wide variety of improved and unimproved test roads.



A Holden Torana taking a bend on one of the rougher sections of track at the Proving Ground at Lang Lang.

All this work is needed for a vehicle designed in Australia for Australian conditions.

Australian driving conditions are frequently tough and tax the engineering and manufacturing skills of automotive designers.

Every test carried out on the Holden range is designed to carry far beyond the zone of normal driving, including bad driving. This comprehensive testing of the entire Holden range, from prototype to production line, is needed to make certain that Holden, the only car designed and built in Australia, can stand up to the demands of the outback and extremes in temperature.

The Holden story has shown how everyone can benefit when men, money, methods, materials and machines are brought together in a healthy atmosphere of competition and incentive.

The nation's population is growing and the economy expanding, year by year. Perhaps even more important, science and technological progress are opening up opportunities for advancement at a faster and faster rate.

No-one can prophesy exactly what these new developments will mean to the future, except that they will mean change for the better. Some indications of future vehicle design are well illustrated by the activities of the GMH Craftsman's Guild, whose object is to promote design and craftsmanship talents in Australian youth. Specifically the entrants are invited to design and build 1/12th scale model cars.

The results of this competition are an expression of modern youth; this is how they see the car of the future and in expressing their thoughts in this way they are creating a trend for future vehicle designers to follow.

There is certainly no end to this story — it is probably just the beginning.