General Motors New Australian Car



The background story of a new Australian enterprise... the entire manufacture in Australia of a car specially designed for Australian conditions. F O R E W O R D

Early in 1945 the Federal Government invited all interested manufacturers to submit proposals for the manufacture of motor vehicles in Australia.

After thorough investigation, General Motors submitted a proposal providing for the manufacture of a car designed expressly to suit Australian conditions.

This proposal made no request for additional tariff protection, subsidies, bounties, import restrictions or other special advantages. The Company indicated that it would welcome any other concern entering the Australian car manufacturing field under the same conditions as General Motors-Holden's Ltd.

This, briefly, outlines the circumstances in which General Motors engaged in one of the most important industrial ventures in Australian history—the starting of a new, complex industry in free and open competition. In nearly four years of intensive preparation, heavy capital outlay, amounting to several millions of pounds, has been made on new plant and equipment and on the development, testing and tooling of the new car.

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Managing Director, General Motors-Holden's Ltd.

Introduction

General Motors new Australian car—Holden— is now in full production and will soon be displayed at our Distributors' and Dealers' showrooms in all States.

A new motor car is probably one of the most important purchases in a lifetime. In making such a purchase, the buyer is in a position to assess for himself a car's value in apparent things, such as styling and colour, acceleration, braking and so forth; but the inherent dependability of the car, its trustworthiness, the sense of security he will enjoy with it, are very much more difficult things to sum up. From his point of view, the all-important question is . . . "How can I be sure in advance that my new car will be dependable?"

Our object here is to give the background story of Holden, which will answer this question for you. We have tried to tell something of the Company that stands behind this new car—the General Motors organisation; something of the enormous engineering and manufacturing resources used in building the car—the greatest group of talents and resources in the industry; we have also described some of the rigorous testing on the bench and on the road, extending over a year and a half and totalling hundreds of thousands of miles.

In this brief outline of the car's development from drawing board to production there are no illustrations of the actual car; these have been prepared for special presentation in colourful catalogues and other literature which are available through Holden Distributors and Dealers.

Holden is now in production. Not one thing has been left to chance; no effort has been spared in making this a car that will meet with your full approval.

We are proud of our new product. We believe you, too, will like it and take pride in it as a credit to Australia and Australian production. Holden is Australia's own car.

The kind of car Australia needs

Australians are great buyers and users of motor cars, so it follows that production of bodies and other components for cars has been a long-established industry in Australia. But it is true that the only cars offered on the Australian market have been designed overseas, and the processes of bodymaking and assembly afforded little opportunity to adapt these cars to the special needs of Australian motorists.

General Motors decision to design and manufacture a car expressly for the big majority of Australian conditions provided the first opportunity to cater for the particular requirements of Australians. Some of these requirements are obvious, and it is easy to see why cars designed in other countries don't fully measure up to what Australians want. For instance, petrol is costly in Australia, so running economy is quite a factor; another thing is that Australia is a country of great distances, and high average touring speed is a desirable characteristic. Road clearance may seem a small point but it is highly important to the motorist to have a car that can take bush tracks as well as city roads; yet another factor is that hitherto all cars have been designed in the Northern Hemisphere in countries which have much greater extremes of temperature than does Australia.

Taking these and many other factors into consideration, General Motors-Holden's Ltd. felt that an Australian car would need to possess as outstanding qualities the following features:—

- 1. Dependability.
- 2. Low First Cost.
- 3. Low Fuel Consumption.
- 4. Roominess without Unnecessary Bulk.
- 5. Good Performance on all Roads.
- 6. Nation-wide Service and Spare Parts Availability.

These basic qualities are outstanding characteristics of this new car. We believe it could only be done because the designers started with a clean sheet. There were no restrictions of existing tools, production machinery or plant. The new car was designed in a new way to be built in a new plant. The new manufacturing layout at Fishermen's Bend is as modern as any automobile plant in the world to-day and for this

Full scale metal drawing graphs are used for greater accuracy

reason has produced a unique car. Never before has a car possessed such a remarkable combination of desirable features: built-in dependability and safety . . . low first cost . . . outstanding performance combined with great economy . . . ample and comfortable seating accommodation . . . splendid vision . . . really comfortable springing for any road . . . excellent road-holding ability . . . easy parking and manoeuvrability . . . roomy luggage compartment . . . and a modern, attractive appearance . . . are just some of these features.

The General Motors new Australian car—Holden—is the kind of car Australians have wanted for a long time.

How Holden was planned

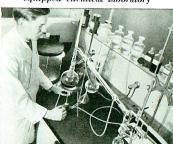
Since Holden was to be designed and built specifically for Australian conditions, the first step was to make a survey of what the Australian motorist wanted most, and to provide for his requirements as fully as possible.

This survey was carefully made by General Motors-Holden's Ltd., the largest and best equipped organisation in the motor industry in Australia. When the basic requirements for the new car were established, they were sent to the head-quarters of General Motors Corporation, where the initial engineering was done.

Using the basic requirements laid down in Australia, the team of design engineers prepared an over-all design. This, the very beginning of the new car, was probably the most interesting stage of its development. In this top-secret department where even the highest executive must have a pass to enter, General Motors designers, engineers and artists gave the new job everything they had . . . to make it new, sleek, low, modern and, above all, the right size for the job it had to do in the country it was being specially made for. Then each section engineer prepared the detailed design of the components for which he was responsible.

A section of the fully equipped chemical laboratory





Nothing was extreme, nothing experimental. The one cardinal rule was: keep to engineering practices which have been thoroughly proved. In the execution of this detailed and complicated task, involving nearly two years' work, the design team had the assistance of General Motors Research Laboratories, the Proving Ground and of the many General Motors Manufacturing Divisions.

When the design was provisionally approved, a full-scale clay model was made, and finally three complete cars were produced. The No. 1 model was then put under the microscope of engineering inspection and tests, and created a most favourable impression. It was good! First of all, in appearance it was like nothing else General Motors had produced or was producing. It was "new." Being the product of engineers who had started with a clean sheet of paper and who had had experience in America, England and on the Continent, the new car seemed to reflect all that was best in the rich experience gained in countries having quite different public demands.

This car was put through a complete series of tests at the Research Laboratories, Proving Ground and at the Fisher Body Division. In performance, economy, comfort and durability it "passed with honours."

At this stage the entire design team and their families, comprising 86 people, came to Australia, bringing with them the first three hand-built cars, together with a great quantity of the special equipment needed for testing. Two more cars were produced and all subsequent planning, engineering and testing have been carried out in Australia.

A test route was selected near Melbourne where durability testing has been carried on continuously for more than 18 months. This test route is approximately 86 miles long, and in every hundred miles of travel it almost exactly duplicates the same proportions of different test roads as in the Proving Ground in America.

But this was just the start . . .

The General Motors Organisation

Before we can describe the significance of the next steps in the production of this new car, it is necessary to give some

The Spectrograph section of the laboratory for testing metals

idea of the General Motors world-wide organisation and of the Australian Company, to show how much the engineers of this car had to call on in terms of knowledge, experience, talents and resources. Space obviously does not permit the printing of this story in full, but these few quick statistics will give a general impression of the size of the General Motors organisation:—

- (1) General Motors consists of 41 divisions and subsidiaries.
- (2) Cars marketed are—

Cadillac, Buick, Oldsmobile, Pontiac, Chevrolet, Vauxhall.

(3) Trucks marketed are-

Chevrolet Utilities and Trucks. Bedford Utilities and Trucks. Maple Leaf Trucks. G.M.C. Trucks.

- (4) Over 33 million vehicles have been produced by General Motors and distributed to every country in the world.
- (5) Total assets approximate 2,500 million dollars.
- (6) Employees exceed 375,000.
- (7) General Motors is a publicly-owned company; stockholders number nearly 450,000.
- (8) General Motors own divisions make almost all the components for their cars and many components for competitive cars in the industry. Some of the better known of these components are—

Fisher Bodies.
Delco Remy Electrical Equipment.
Delco Brakes.
Packard Electric Cables.
Guide Lamps.
Harrison Radiator Cores.
New Departure and Hyatt Bearings.
AC Electrical Equipment.

The dynamometer is an instrument which measures engine power and economy







(9) Among the many non-automotive products made by General Motors are—

Allison Aero Engines.

Diesel Electric Locomotives.

Diesel Engines. Delco Electric Motors. Frigidaire Refrigerators.

Lighting Plants.

Electric Stoves.

Washing Machines.

- (10) General Motors has the biggest overseas organisation in the automobile industry, being represented in more than 100 countries.
- (11) General Motors employs the greatest team of designers, scientists, chemists and engineers in the automobile industry—and probably in any industry.
- (12) General Motors spends more money in research and testing than any other automotive manufacturer-and probably more than all others combined.

All this-scientific research, engineering leadership, unequalled resources, and reputation for good workmanship and fair dealing-is behind Holden.

Of all these resources, two stand out as being all-important in the manufacture of this new car. One is the General Motors Research Laboratories and the other the General Motors Proving Ground.

The General Motors Research Laboratories

The General Motors Research Laboratories are a special division of the Corporation, founded by Mr. C. E. Kettering, who made the first self-starter and originated and developed many automotive achievements, including battery ignition, duco lacquers, Ethyl petrol, synchro-mesh, two-stroke diesel engines . . . to mention a few.

Much of the work of Research is unspectacular. Deciding the right type or alloy of steel or iron for a particular part; what heat treatment will produce the best result; what happens in the combustion chamber of an engine; how to improve brake linings so the stopping power of modern brakes may match the increased efficiency of modern engines. The answers to these and to countless other problems may never hit the headlines of the World's Press, but they do have a vital effect on the comfort, durability and safety of the vehicles we drive to-day.

> The speedway at the G.M. Proving Ground at Milford, Michigan

General Motors Research Division delves into problems still unsolved by science, enriches the fund of knowledge at the service of engineering and applies existing knowledge to the betterment of products now in use.

In these two big institutions—the Research Laboratories and the Proving Ground-there will always be new horizons.

Our present interest in General Motors Research Laboratories lies in the fact that both directly and indirectly they contributed to the design of Holden. No new car has ever before had such a background of scientific skill and achieve-

General Motors Proving Ground

The General Motors Proving Ground is unique in the automobile industry. It covers an area of 1268 acres at Milford, Michigan, near Detroit, and represents the world's largest outdoor laboratory . . . a fact finding institution which has developed its own special techniques for testing cars far beyond the point of endurance reached in normal driving.

Since 1924 over a hundred million miles have been travelled by cars undergoing tests, thousands on thousands of tests of components have been made, and a multitude of opinions and vague notions have been eliminated.

In the span of just over 24 years, since the first car drove its first measured mile at the G.M. Proving Ground, brakes have gone from two wheels to four wheels; cylinders have multiplied from four to sixteen; helical gears have supplanted spur gears in the transmission; the bumps in the roads have been levelled out by independent front wheel suspension, and coil springing on all four wheels; synchromesh transmission, gear shift on the steering column, and now, automatic transmission, have been developed; all-steel bodies and the famous Turret-Top, No-Draft ventilation, seat adjusting mechanisms, greater vision and reduction of "blind

The "fifth wheel" accurately records mileage for petrol economy tests

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spots" for the driver, have all contributed to more comfort and safety; new alloys, lighter metals, and a host of engine improvements have been tested and further developed to provide greater performance at less cost.

Experimental garages are maintained by each of the Divisions of General Motors at the Proving Ground, and are operated independently of one another under the supervision of the engineers of the particular division. In addition, cars of all makes are tested and compared with G.M. products and this enables an evaluation to be made of General Motors cars against all other products.

A complete and official Weather Bureau at the Proving Ground provides accurate readings of wind velocities, temperatures, and barometric pressures, records sunlight, and gauges the snow fall, humidity and rainfall. Nothing is left to chance, and the recordings are taken into consideration when cars are tested under variable weather conditions.

G.M. Engineers solved the problem of accurate speed recording by designing a fifth wheel which is accurate in diameter to hundredths of an inch. The pressure in the tyre is also correct, and fitted to the wheel which is almost frictionless in its operation is a small electric generator which records miles in terms of volts. The faster the wheel turns, the stronger the electric current, and inside the car, sensitive meters measure the electricity which is being generated by the fifth wheel. There is no margin of error here. The readings are final and correct.

To stop a car weighing 4,000 pounds from 80 m.p.h. enough energy must be absorbed by the brake linings to raise the entire car in the air over 200 feet. This gives some idea of the work brake linings are called upon to perform, year after year, stop after stop.

In testing brakes at the Proving Ground perhaps 250 emergency stops of this nature will be made by the test car during a single day's driving of 24 hours. It is a ruthless endurance test. Speed, more speed and—stop! The performance goes on and on until the brake linings are worn to a mere shadow of their former selves.

But all the work is not performed on the roadways, the inclines, in the water baths, and so on. Much work is done in the laboratories. Engines are tested for extraneous noises by

> The new foundry at Fishermen's Bend is unique in Australia

the audiometer, and the cause of these noises is analysed to eliminate the error in measurement of a component, or the friction of some part. Improved silencers, more silent transmissions—in fact, a more silent engine at varying speeds is the result of this research.

Engineering research at the G.M. Proving Ground is never-ending . . . one big reason why the customer's money goes farther in a General Motors vehicle.

The Australian Organisation

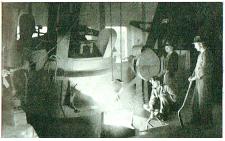
General Motors came to Australia in 1926 and commenced operations with approximately 1,500 employees. Holden's Motor Body Builders Ltd., of Woodville, South Australia, merged with General Motors (Australia) in 1931, the name of the Company then becoming General Motors-Holden's Ltd.

In the period starting with 1927 (its first complete year of operation in Australia), up to and including 1947, the Company has produced in Australia nearly 350,000 Cars, Trucks and Utilities. During the war period, the company devoted the whole of its resources to the production of munitions and equipment for the Services. War production which reached a value of over £37,500,000 included (apart from thousands of service vehicles) aero engines, 2-pounder, 6-pounder and 25-pounder guns, Diesel marine engines and several types of boats.

Since 1939 there has been a great expansion of manufacturing facilities which has been dramatically accelerated by the introduction of the new Australian Car. The extent of this expansion is best illustrated by the fact that when the first Holden came off the production line the company was outlaying in its Australian operations, funds approximating £8.500,000.

The total factory area, including roadways, now exceeds 94 acres, which is the largest production area held by a single

Here is the Jig-borer—so accurate on small work that errors cannot be measured





unit in the motor car industry in Australia. The activities of General Motors-Holden's Ltd. are widespread, including plants in Brisbane, Sydney, Melbourne, Adelaide and Perth, covering not only the manufacture of the new Australian Car, but the continuous importation of motor chassis and components from England, Canada and the U.S.A., together with the manufacture of bodies at Woodville for these chassis.

In addition there are other divisions, such as the Service Division, the Industrial and Domestic Equipment Company, the Frigidaire Division, and the National Automotive Service Company.

Employment has increased with the expansion of the Company's activities. To-day approximately 7,250 people are employed throughout Australia and it is anticipated that this figure will stabilise at about 9,000.

Testing the new car in Australia

The testing of General Motors new Australian car in Australia was done on a gruelling test course carefully selected for the great diversity of road surfaces it contained and for the varying conditions of driving it offered.

In selecting this Australian test route, General Motors-Holden's engineers were guided by the experience gained at the General Motors Proving Ground. Actually the Australian route closely paralleled the American one in the number of miles of each different type of road surface. If anything, it is thought that the Australian route may have been a little more severe.

To give you an idea of the hard grind of test driving, it was estimated that driving on the durability route was equal to at least four times the mileage of normal owner driving.

A further illustration of its extreme severity is found in the short life obtained from tyres used on these test cars, new tyres being "cut out" in from 3,000 to 5,000 miles, compared with 20,000 to 30,000 miles often achieved in normal driving!

Another interesting sidelight on the severity of the testing is that it took some weeks to train test drivers to drive the cars "hard." Drivers' natural tendency is to "spare" their cars, but durability testing cannot afford to spare anything.

This kind of treatment over a gruelling course was not merely a haphazard fancy of experimental engineers. Back

General view of part of the new engine manufacturing plant

of all this kind of testing was the experience General Motors have had at the Proving Ground in Milford, Michigan.

Perhaps the strongest evidence of the thorough testing to which the new car had been subjected is the fact that each test car has done 50,000 miles of durability testing, although overseas durability testing mileage established as the result of long experience is only 25,000. After completion of 50,000 miles, each car was completely dismantled and every part carefully examined by the laboratory and design engineers.

All through the durability tests continuous records were kept of performance and petrol economy. In all these tests the results have been most satisfactory—for example, in our test over 600 miles of varying conditions of driving and roads, "Holden" gave a petrol consumption of over 37 m.p.g. at speeds which averaged 35 m.p.h.

After eighteen months of testing, a pilot run on the assembly line was planned. A "pilot run" meant that a number of cars was produced for testing—not for the public. During the pilot run the actual machines and the men were given a full dress rehearsal for the full-scale production of components, and all problems in the assembly of components were ironed out. These cars then went right back to the experimental engineer for further tests before the O.K. was given by the chief engineer to start rolling.

Production in Australia

General Motors-Holden's Ltd. has been completely equipped for the manufacture of the new Australian Car. Not less than 92% of the new car is made in Australia from Australian materials, and this percentage will be progressively increased as local manufacture is able to provide the small number of components that will be imported initially.

There are only two of these machines in the world—a G.M. crankshaft centring machine





Over three hundred Australian manufacturers and suppliers contribute to the over-all task of producing the new car and their contribution will be extremely valuable.

General Motors-Holden's own plants, in addition, carry out very extensive manufacturing operations and for this purpose large, new buildings have been erected and equipped with the world's most modern machine tools at a cost running into millions of pounds.

Manufacture of components for the engine, using techniques completely new to Australia, is centralised at a new plant and foundry at Fishermen's Bend, Victoria. This is as advanced as any automobile plant of its kind in operation anywhere to-day. It was designed from the start to contain all that was best and most modern in the experience of all the Divisions of General Motors throughout the world. The cost of this new Melbourne plant and equipment, including the foundry, exceeds £2,100,000.

Much of the highly specialised equipment is new to Australia. Highlights of some of this equipment are:—

Ingersoll Cylinder Boring Machine bores all cylinders in one operation and was specially designed for producing the Australian car.

Red Ring Gear Shaving Machine adds the final finish to transmission gears for silence and durability.

Induction Heat-Treatment Equipment permits heat treatment of camshafts to be undertaken in the production line.

Flash Butt Welding Machine was designed and built in Australia and produces a weld stronger than the parent metal. Micro-form Profile Grinder is used for cutting tools used in making components which are of irregular shape.

Jig Borer is kept in a special pressurised room. Vernier and micrometer heads read to units of 50 millionths of an inch.

Machines, however, are only as good as the men who use them. To ensure that the magnificent new equipment installed in its Australian plants was used to the best advantage, General Motors-Holden's arranged with General Motors Corporation to bring to Australia a team of highly skilled experts in modern manufacturing methods. These men, rich in experience gained in many of the world's most famous automobile factories, supervised the initial production of the Australian car. In addition, they trained Australian personnel,

Gleason Spiral Bevel Generator shown operating on rear drive pinions

passing on to them the benefits of their skill and experience so that, in due course, thoroughly trained Australians may take over their responsibilities.

Many Australian engineering and manufacturing personnel were sent overseas during the design and initial production stages of the car.

These men made an important contribution by their knowledge of Australian conditions and manufacturing facilities. At the same time, they acquired valuable experience through seeing and working in some of the world's greatest automotive plants. With this added experience, they are now playing an important part in the production of the new car.

Over and above all operations in General Motors-Holden's plants, each having its own strict controls, is a Standards Section, the main functions of which are to plan the manufacture of all items on the most economical basis, to maintain standards of quality in all phases of production, to plan the layouts of plants and positioning of machines, and to maintain the highest working comfort and efficiency for the employees.

At Woodville, South Australia, the body-building plant has been completely re-organised at a cost of approximately £1,750,000. Here again new plants and new machines result in more modern manufacturing operation and give a new significance to the time-honoured insignia: Body by Holden.

The new Woodville plant makes possible manufacturing principles new to Australia; it brings a new type of comfortable seat springing, a new safety in body design and a new quality and finish that finds quick appreciation among owners.

In addition to the manufacturing operations at Fishermen's Bend and Woodville, there are assembly plants at both these points as well as at Pagewood, New South Wales; The Valley, Brisbane, and Mosman Park, Perth.

> Heat treatment of the camshaft hardens the cams only





The new General Motors-Holden's organisation is the biggest and the most modern car manufacturing and engineering set-up in Australia. It is an organisation that is confident it can produce a vehicle worthy of taking its place beside the great line of cars made famous by G.M. engineering.

Holden Distribution

Wherever you live there is a General Motors Distributor or Dealer not far away. The organisation of nearly 600 General Motors Distributors and Dealers throughout Australia has been in existence for over 20 years. General Motors new Australian car is, therefore, represented in every major town in the Commonwealth by thoroughly experienced and equipped establishments who will gladly serve you.

This means that not only can you arrange for purchase at a convenient centre but also you can rely on a high standard of specialised service.

Mechanics have been trained in every detail of Holden and your local dealer has all the backing of General Motors in making available specialised knowledge, tools and equipment.

Holden Service

To ensure the best and most economical service to owners of its vehicles General Motors-Holden's maintains an active Service Department, whose representatives keep in contact with the hundreds of Distributors and Dealers on everything pertaining to the service of vehicles on the road.

General Motors Service Department gathers technical knowledge and distributes it to General Motors' Distributors and Dealers, throughout Australia. Its activities include:—

- (1) Supply of technical information regarding the Company's products (by the distribution of literature and the activities of Service representatives).
- (2) Making available special tools and equipment for the proper servicing of vehicles.
- (3) Furnishing advice on facilities, service station layouts, and service organisation.
- (4) Instructing Distributors' and Dealers' mechanics in proper methods of service (by schools, lectures, films, and personal contact).

Assembly plants are located at Brisbane, Sydney, Melbourne, Adelaide and Perth

- (5) Providing a special Home Study Course for mechanics and apprentices.
- (6) Providing a liberal warranty on new vehicles, which represents the Company's guarantee of quality.

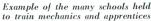
Holden Spare Parts and Accessories

Every car needs a new part at some time. At these times the owner looks for prompt, efficient, reliable, low-cost service. The National Automotive Service Company is a division of General Motors-Holden's Ltd., dedicated entirely to the supply of genuine replacement parts and accessories. The National Automotive Service Company—or NASCO, as it is known—is the largest parts warehouse of its kind in the world, carrying a stock of over five million genuine parts and accessories in 34,000 different categories. Prompt service is therefore assured—even to the air-freighting of parts in cases of emergency. For the additional protection and service of owners, NASCO strictly controls the manufacture and supply of genuine parts, and precautions are taken to ensure all parts measure up to the original engineering blue-prints in quality, size and performance.

The NASCO organisation of 700 Distributors, Dealers and Stockists is represented in every major town, ensuring on-thespot service for replacement parts at all times.

Hire Purchase Plan

General Motors Acceptance Corporation is a special finance division of the Company, organised to provide a service, widely known as the GMAC Plan. This plan is offered exclusively through Distributors and Dealers in General Motors products. Its convenient terms and low charges provide a highly satisfactory way to obtain General Motors products and offer facilities not obtainable under other finance plans.











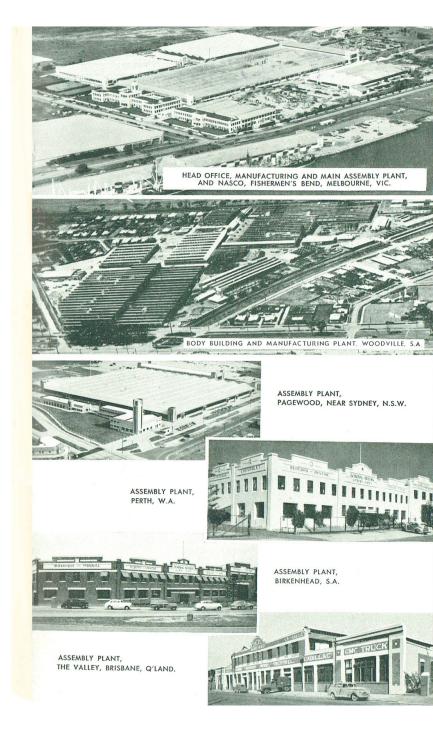
It is fitting that the new Australian car should bear the name HOLDEN. For more than 30 years the Holden Motor Body Works of South Australia have been famous. After the merger with General Motors (Australia) Pty. Ltd. in 1931 the Company became General Motors-Holden's Limited, and the first Chairman of Directors was the late Sir Edward Holden, K.B. The HOLDEN car will worthily carry on a great tradition of Australian industrial development.

We hope that this booklet has answered some of the questions you may have had in mind about the new Australian car, Holden.

No doubt there are still more points on which you would like information. If there are, telephone or call on a General Motors Distributor or Dealer. He will be glad to see you and send or give you literature with more news and details of Holden. You can arrange with him, too, to inspect and drive the car to satisfy yourself that it is everything we claim of it.

GENERAL MOTORS-HOLDEN'S LIMITED

Brisbane - Sydney - Melbourne - Adelaide - Perth



General Motors
New

Australian Car

HODEN



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