



THE BUILDING OF  
QUALITY CARS AND TRUCKS

ROOTES PRODUCTS

HUMBER HILLMAN SUNBEAM SINGER COMMER KARRIER



**OVER 4,000 DISTRIBUTORS AND DEALERS THROUGHOUT THE WORLD**

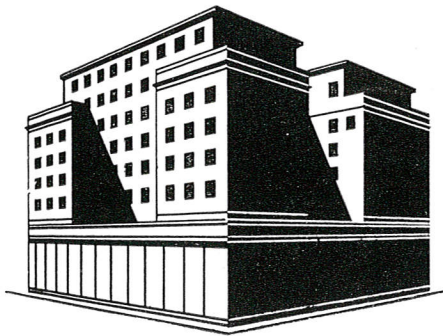
**SALES AND SERVICE IN 152 COUNTRIES**





## ROOTES PRODUCTS

### HUMBER, HILLMAN, SUNBEAM AND SINGER CARS COMMER AND KARRIER COMMERCIAL VEHICLES



The manufacture of quality cars and trucks in volume is a fascinating story.

Into the factories go the raw materials—the forgings and bars of steel, the pig iron, and a thousand-and-one other items—to emerge as elegant, ultra-modern cars and sturdy, dependable trucks.

But what of the processes between—the people and plant contributing towards the final product?

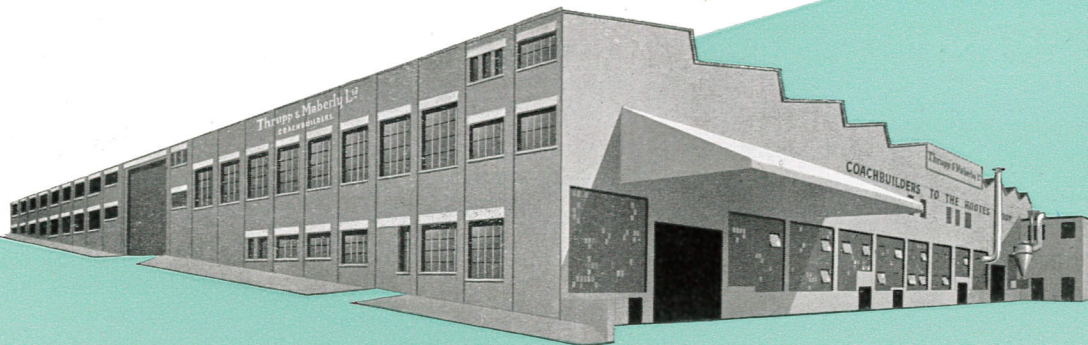
The reader may well be impressed by the bold conception that high quality could be combined with large volume production, and by the intricate background of scientific planning which has made that conception a reality.

This, then, is the achievement of the Manufacturing Division of the Rootes Group. It is also the latest chapter in the story of a great enterprise that has stemmed from a single workshop set up in Kent in the early part of the century to become a group of factories with a total production area of over seven million square feet.

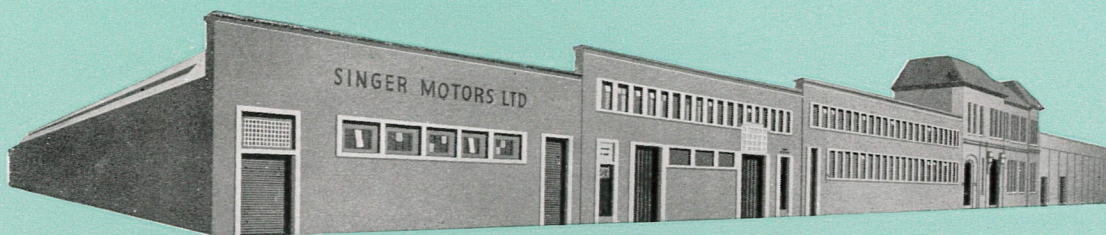
Moreover, the Group has its own representatives in every major market in the world, and also fifteen concessionaire companies overseas. Additionally, there are eleven plants overseas where Rootes Products are assembled locally.

Rootes Products are backed by a sales and service organisation in 152 countries, and the size and scope of the Rootes Group's activities at home and abroad are increasing continually today.





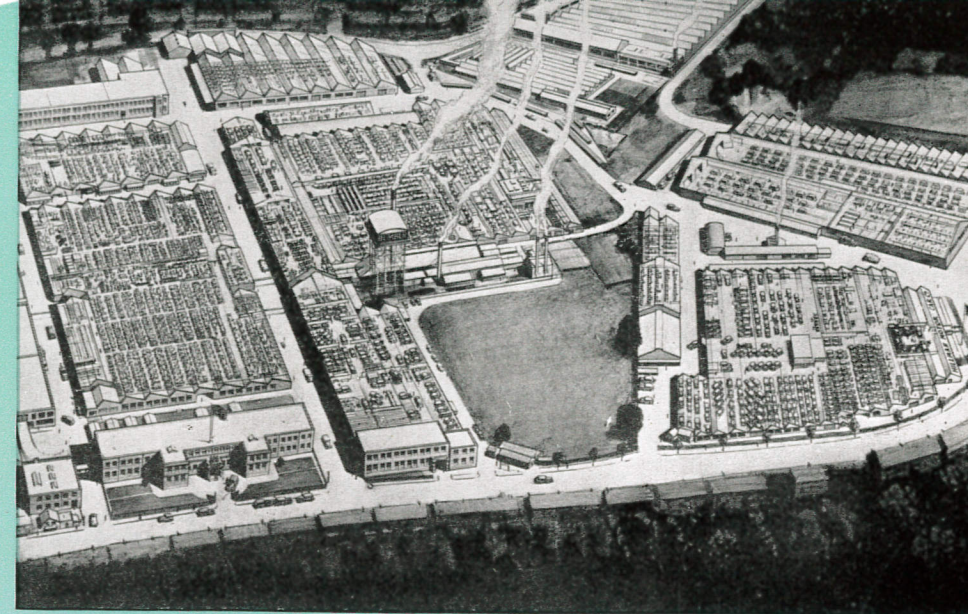
**THRUPP AND MABERLY (LONDON)** Founded in 1760, this firm of quality coach-builders has been an integral part of the Rootes Group for many years, and is engaged on the production of hard-top and convertible car bodies.



**SINGER MOTORS (COVENTRY)** The acquisition of Singer Motors in 1956 added manufacturing facilities at both Birmingham and Coventry to the Group's resources. The Coventry plant has been adapted in line with the overall programme of rationalisation.

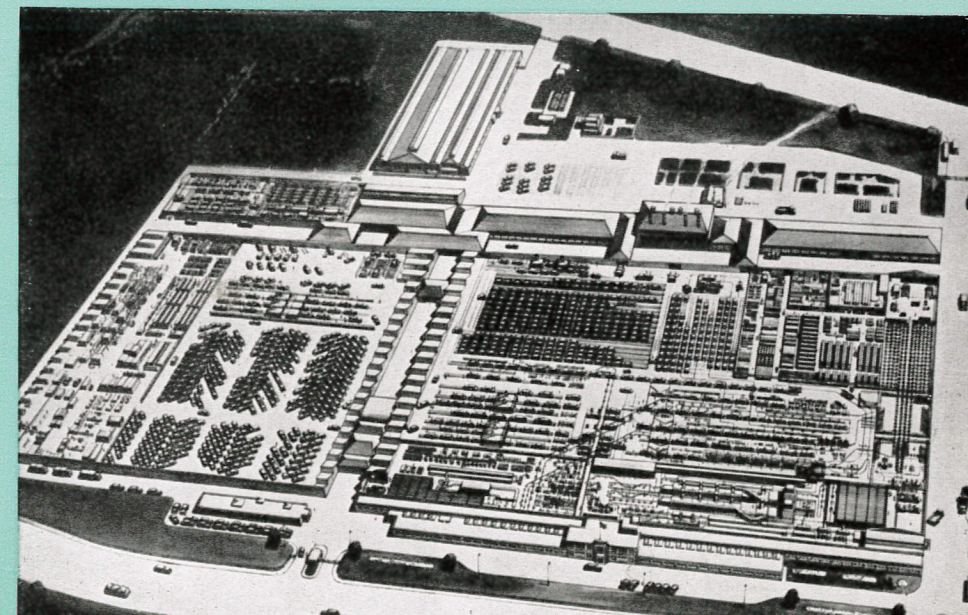


**BRITISH LIGHT STEEL PRESSINGS (LONDON)** Acquired in 1937, British Light Steel Pressings manufactures hundreds of all-steel bodies and cabs each week, in addition to a variety of pressed steel components for most vehicles in the Group's range of products.



**STOKE FACTORY (COVENTRY)** This is a development from the works originally built by Humber Limited in 1908. Today the factory, which is devoted almost entirely to machining, sub-assembly, body painting and trimming, comprises a covered area of 1,588,000 square feet.

**RYTON FACTORY (COVENTRY)** The Ryton factory, comprising a covered area of 1,077,000 square feet, forms the final assembly plant for car production and light vans. Components for subsequent assembly in the overseas plants are also packed and despatched from here. Units, bodies and component parts flow into Ryton at the rate of over 4,000 vehicle sets per week.





## **R O O T E S   G R O U P   M A N U F A C T U R I N G   D I V I S I O N**

Rootes Motors Limited is the parent company controlling the interests of the Group. The manufacturing undertakings are:

**Humber Limited, Coventry**

**Hillman Motor Car Company Limited, Coventry**

**Sunbeam-Talbot Limited, Coventry**

**Singer Motors Limited, Birmingham and  
Coventry**

**Commer Cars Limited, Luton and Dunstable**

**Karrier Motors Limited, Luton and Dunstable**

**Thrupp and Maberly Limited, London**

**British Light Steel Pressings Limited,  
London**

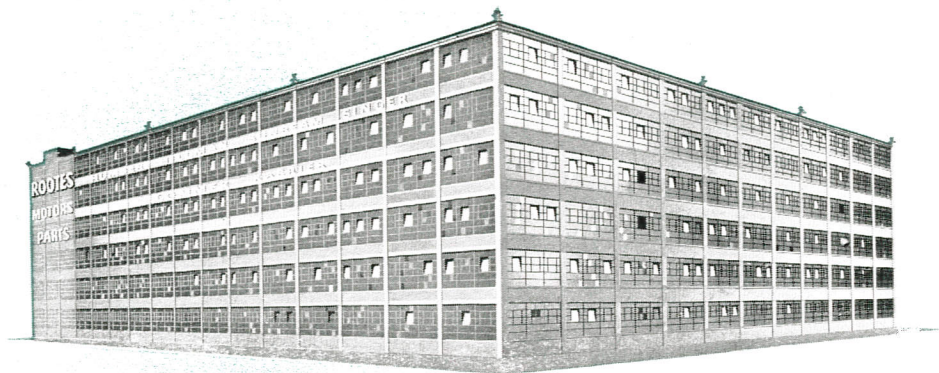
**Tilling-Stevens Limited, Maidstone**

**Rootes Motors (Parts) Limited, Birmingham**

While the rapid expansion of the Group's manufacturing division has inevitably led to certain decentralisation, Coventry constitutes the headquarters of the passenger car manufacturing side while that for commercial vehicles is situated at Luton and Dunstable. Other plants at London, Birmingham and Maidstone, all make valuable contribution to the overall manufacturing programme.

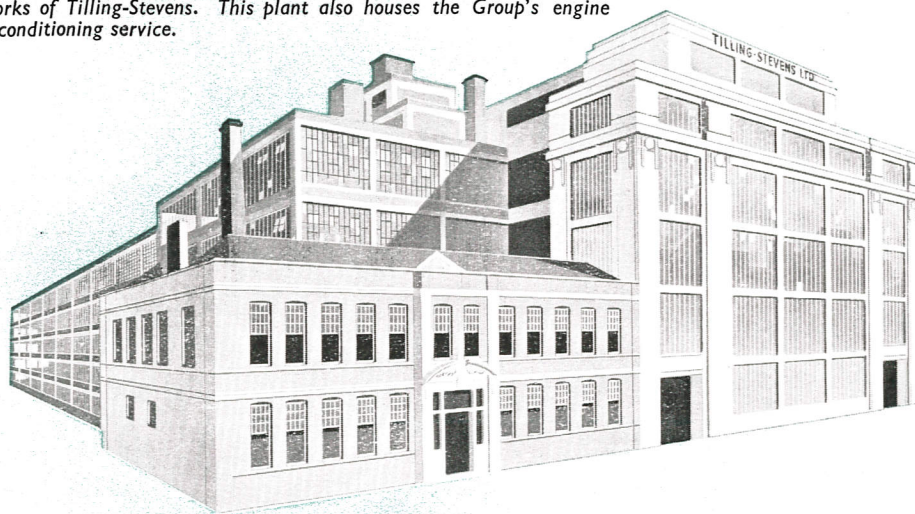
It is hoped that this illustrated Brochure will provide an insight into the fine craftsmanship and skilled operations which go into the making of quality cars and trucks.



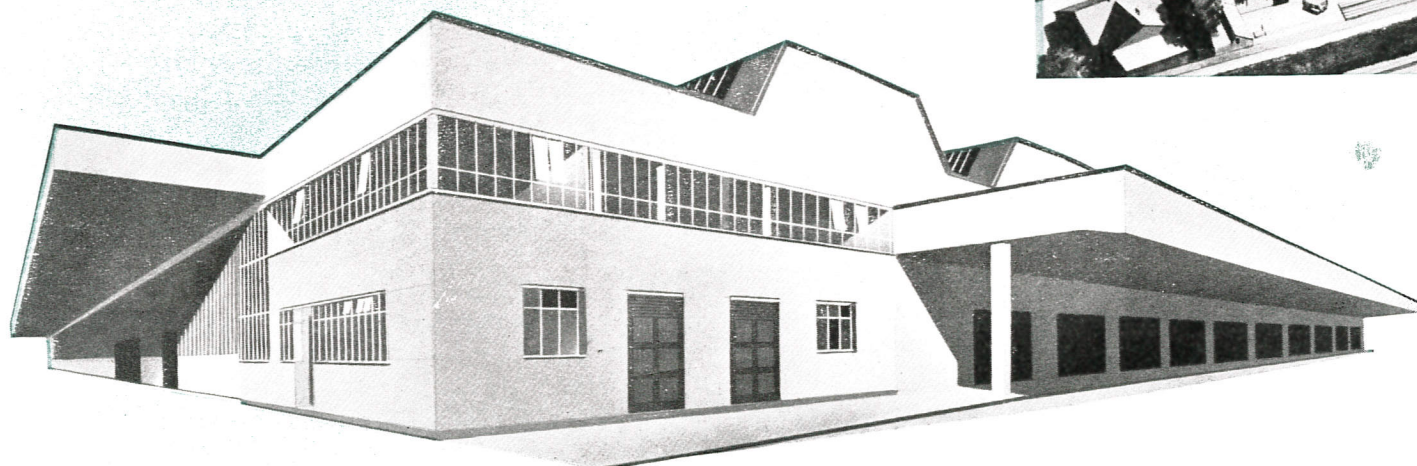
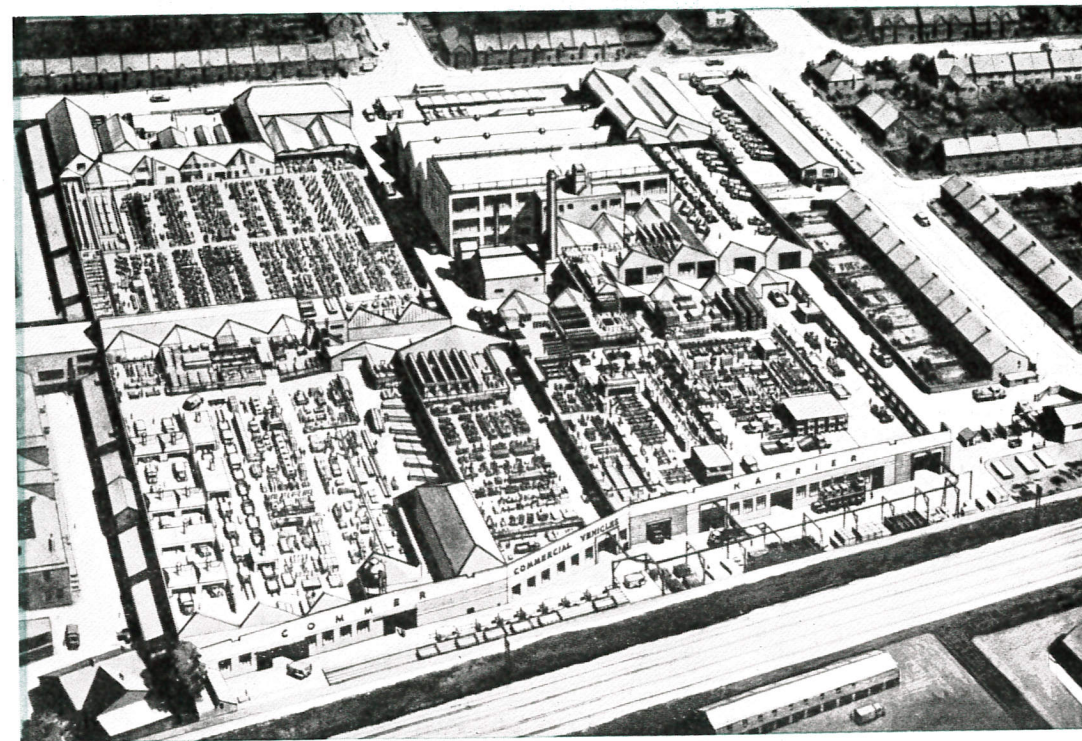


**ROOTES PARTS (BIRMINGHAM)** The Group's world-wide parts division has now been centralised at Birmingham. With half-a-million square feet of covered floor space, this will provide a stores and supply organisation unrivalled in Great Britain.

**TILLING-STEVENS (MAIDSTONE)** The very popular Rootes two-stroke opposed piston Diesel engine is produced at the Victoria Works of Tilling-Stevens. This plant also houses the Group's engine re-conditioning service.



**COMMER/KARRIER (LUTON)** Headquarters of the truck manufacturing division, the Luton factory has a covered area of 320,000 square feet. It is responsible for the machining and sub-assembly of units in the Commer/Karrier range.



**COMMER/KARRIER (DUNSTABLE)**

The Dunstable plant, opened in 1954, increased the volume of truck production into line with the growing demand for Commer and Karrier products. With a covered area of 275,000 square feet, it is the Group's main assembly plant for commercial vehicles.



## DESIGN

For all practical purposes, the story begins once a new project has been conceived in the minds of the Board of Directors, and information such as overall size, passenger or load rating, power requirements and degree of rationalisation has been passed over to the Design Department for development into practical form.

First to take a hand is the Engineering Studio attached to the Stoke factory where trained personnel, possessing a highly developed artistic ability combined with a background of basic engineering knowledge, interpret the Board's views into a series of preliminary design drawings. From this stage, scale models in wood and plasticine are constructed, superimposed against natural backgrounds and photographed so that their lines and general appeal can be accurately assessed.

A final selection is made and a full size mock-up constructed in wood by expert craftsmen, many of whom have been engaged all their lives upon similar work. Once this has been mounted upon wheels, painted and fitted out with seats, trim, glass and all interior appointments, the mock-up becomes an exact replica of the model it is desired to achieve. Continuous alterations and adjustments are made to improve every aspect of design, until a point is reached where approval is given for the construction of actual prototype vehicles.

Again, in the first place, these are hand-built by trained craftsmen working in well equipped workshops adjacent to the Studio, and when completed are subjected to the most intensive proving programme on test rigs and roads both at home and overseas. Only when all are completely satisfied with the results achieved is the project judged ready for production.



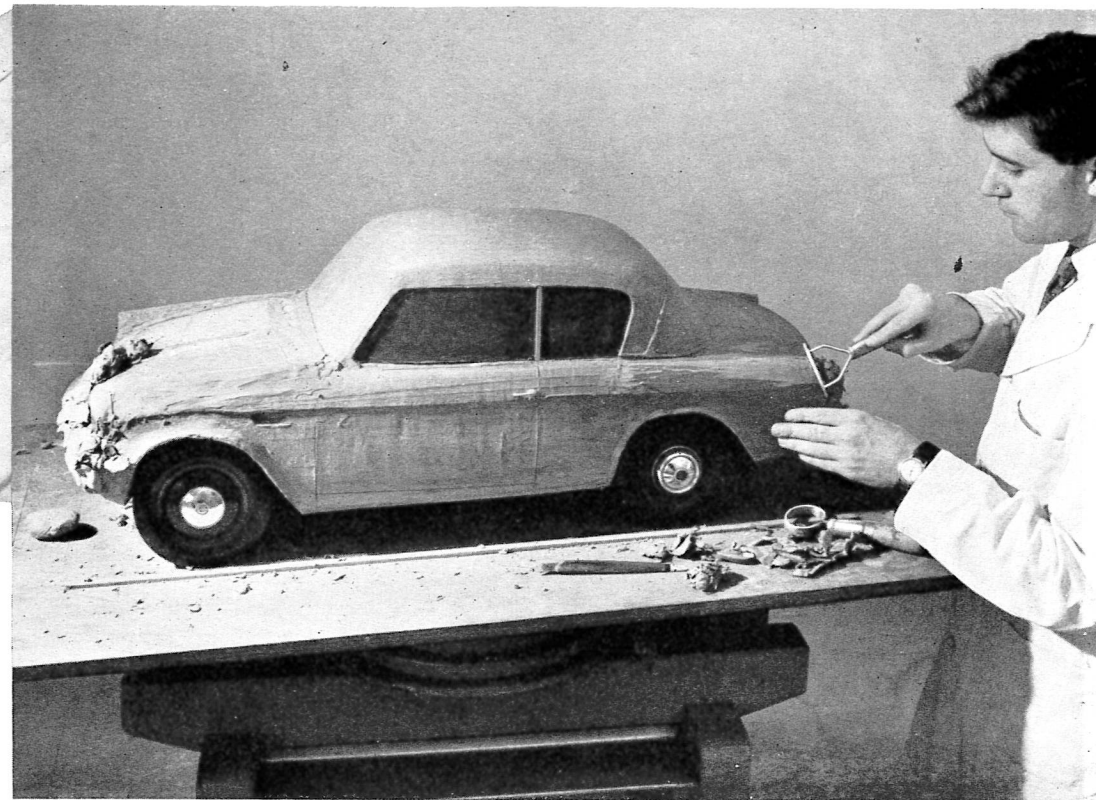


*In the Engineering Studio highly trained personnel interpret broad terms of reference into a series of design drawings for management consideration.*

## ENGINEERING STUDIO

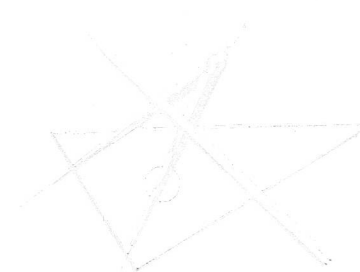
Stylists and craftsmen work in a bright, airy and spacious studio which has been carefully laid out to cater for their special needs, and to provide ideal working conditions. Within these walls, the sketching of new ideas and the construction of scale and full-size models is a continuous process directed at producing designs for models scheduled from one to five years ahead.

Obviously some of the schemes never materialise in practical form, but



*From the two-dimensional sketch, the chosen design is built in wood and plasticine to provide an accurate scale model from which the general line and shape may be assessed.*

from the ideas put forward the eventual designs are developed for each of the Group's many models. Studio technicians work in closest harmony with both body and chassis engineers, in order that the chosen design may achieve strict balance between aesthetic appeal and the practical considerations of its production and use.







*At Stoke (Coventry) one block of offices comprises the Engineering and Planning Departments. Thus at one end are those who design and at the other end those who are engaged in devising and perfecting the method of production.*

## CHEMICAL LABORATORY

The Chemical and Metallurgical Laboratories form an integral part of the efficient inspection system which is responsible for maintaining quality at its highest level.

From the raw materials, forgings, castings and other components flowing into the factories, samples are taken at random for thorough chemical and physical analysis to see that they conform in every detail to the approved specification.

At the same time, continuous checks are carried out upon all the various processes such as heat treatment, plating, anodising, paint spraying and phosphating.

The Laboratories also conduct independent investigations into new materials, processes and improved specifications.

## DRAWING OFFICE

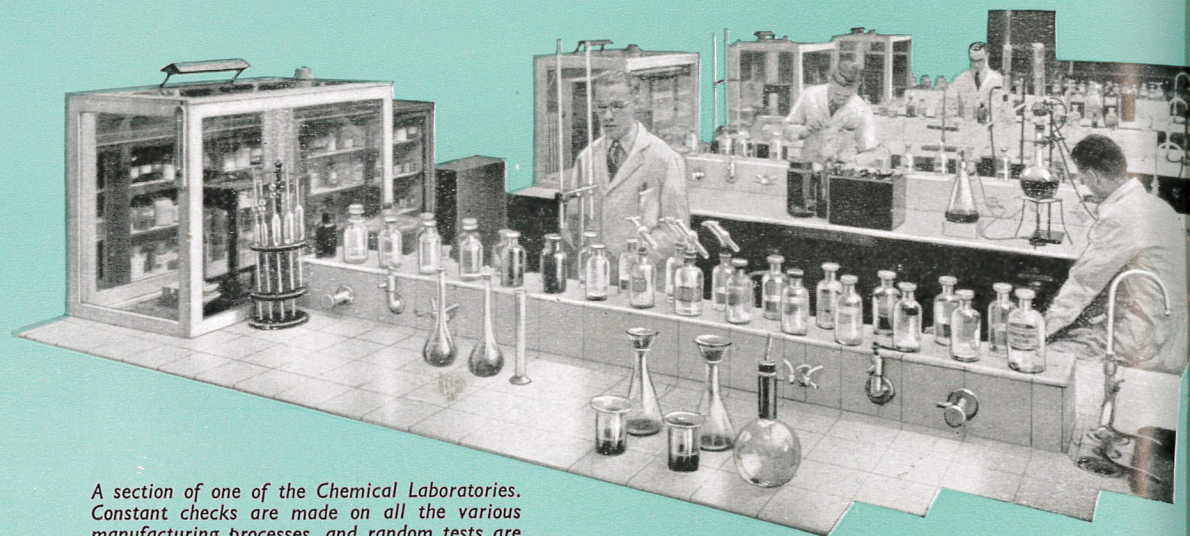
So extensive is the range of vehicles and units manufactured within the Group that it has been found convenient to equip most of the numerous plants with separate drawing offices, enabling the draughtsmen to obtain a direct appreciation of the problems peculiar to their own manufacturing responsibilities.

Naturally, the work of the smaller offices is ancillary to that of the main Design Office which for Humber, Hillman, Sunbeam and Singer Cars is situated at Coventry, and for Commer and Karrier Commercial Vehicles at Luton.

The Drawing Offices employ a large staff of designers, draughtsmen and calculators who work in very close harmony with the Engineering Studio, Technical Cost Engineers, Research Departments, Laboratories and Planning Department.

Line and style from the mock-ups are interpreted into precise engineering terms, an operation often involving many thousands of dimensional drawings ranging from full-scale layouts to the smallest details.

At the same time specialist sections dealing with power units, transmissions, suspension and so forth, develop their own progressive designs to dovetail in with those of the body engineers.



*A section of one of the Chemical Laboratories. Constant checks are made on all the various manufacturing processes, and random tests are carried out on raw materials to ensure a consistently high standard.*





*The checking of cars under conditions of extreme cold is but one of the exhaustive proving tests to which the Group's vehicles are subjected in the Research Department.*

## DEEP FREEZE

The "Deep Freeze" forms part of the elaborate and costly test equipment housed in the Research Department at Ryton.

Sub-zero temperatures are easily achieved, thus allowing various problems associated with cold weather operation to be more fully understood and catered for.

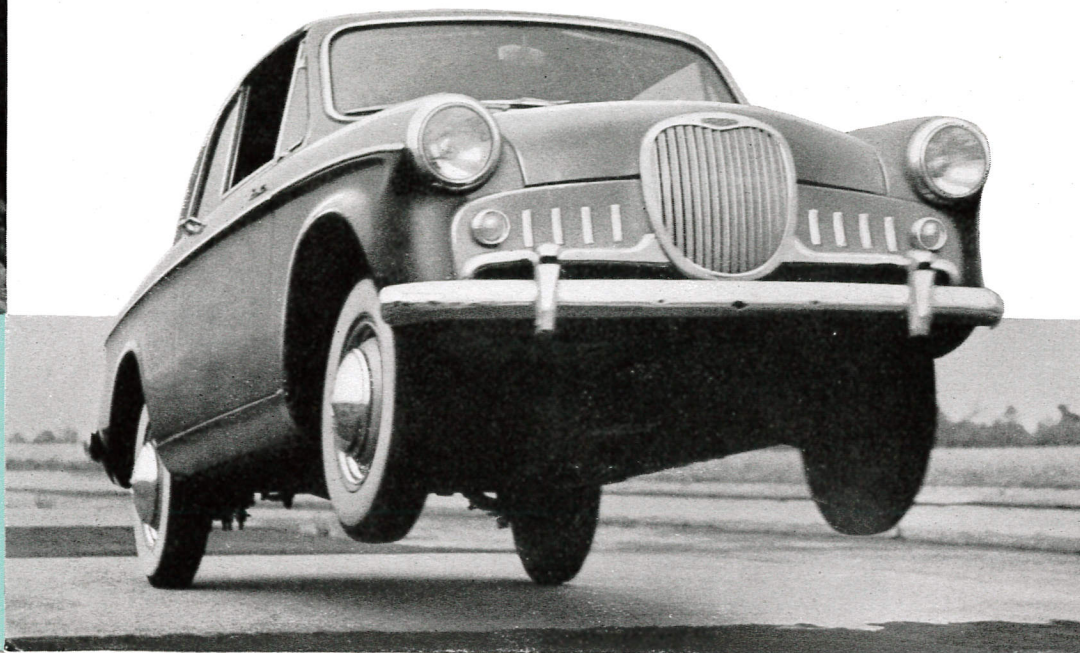


## TEST COURSE

To ensure reliability in over 150 countries demands the most exhausting proving programme.

In the initial stages this takes place at the modern Proving Ground of the Motor Industry Research Association where the more arduous overseas conditions are artificially but accurately reproduced.

Prototype vehicles are run for very extended periods over such tests as the pavé track, noise and vibration producing circuits, and the very rough cross-country course where structural weaknesses and other



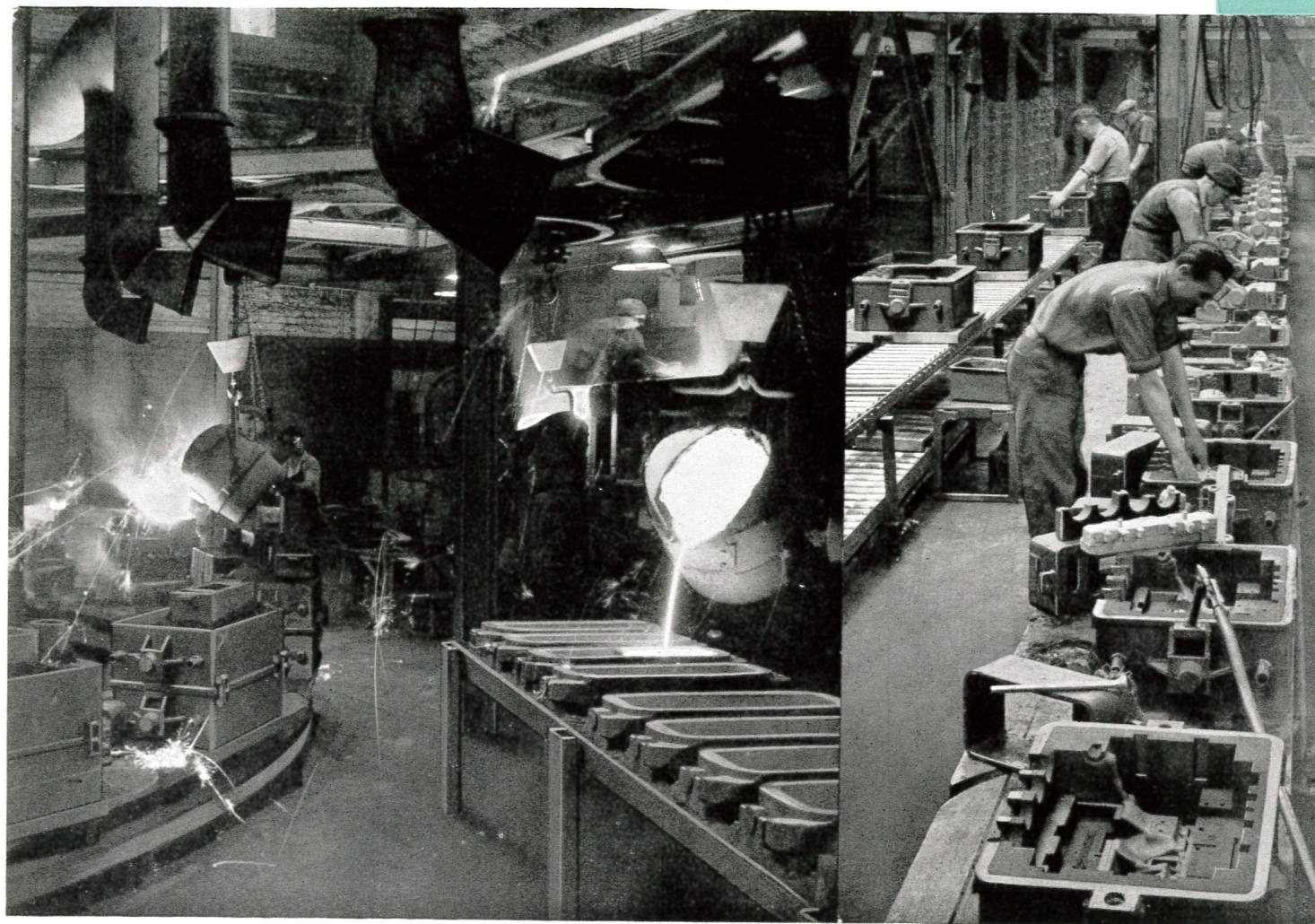
*Valuable suspension data is obtained from tests carried out at the Motor Industry Research Association's proving ground.*

defects are quickly exposed. A hundred miles over the pavé track subjects a vehicle to punishment equivalent to many thousands of miles of normal motoring.

Later on, teams of trained technicians accompany vehicles overseas, where the whole series of tests are repeated under actual conditions in extremes of climate and terrain.

*Particular attention is given to sealing the Group's cars against the entry of water and dust, and a vehicle is shown undergoing a severe water test at the Motor Industry Research Association's proving ground.*





*Casting of Hillman Minx cylinder block showing, on the left-hand side, molten metal from the cupola being poured into the moulds. Metal remaining in the ladle after pouring is being transferred to pigs from whence it is returned to the cupolas.*

*A view of the mechanised track system showing cores being inserted into the lower half of moulds for the Hillman Minx cylinder blocks. At a later stage the upper portion of the mould is added and the completed assembly progresses to receive the molten metal.*

## PASSENGER CAR PRODUCTION

### Foundry

The ever increasing use of castings in modern motor car construction was anticipated by the Group many years ago, and one of the most modern foundries in the Industry is installed at the Stoke Factory. Operating on the continuous track system, the output includes among many other units the casting of over 3,000 cylinder blocks for Light Vehicle engines alone.

The same principles of strict control apply here, as well as elsewhere in the factory, and laboratory tests for quality of metal, sand and other materials are continually being made. The patterns and equipment are all metal, and the accuracy of every detail is as great as in the machine shops.

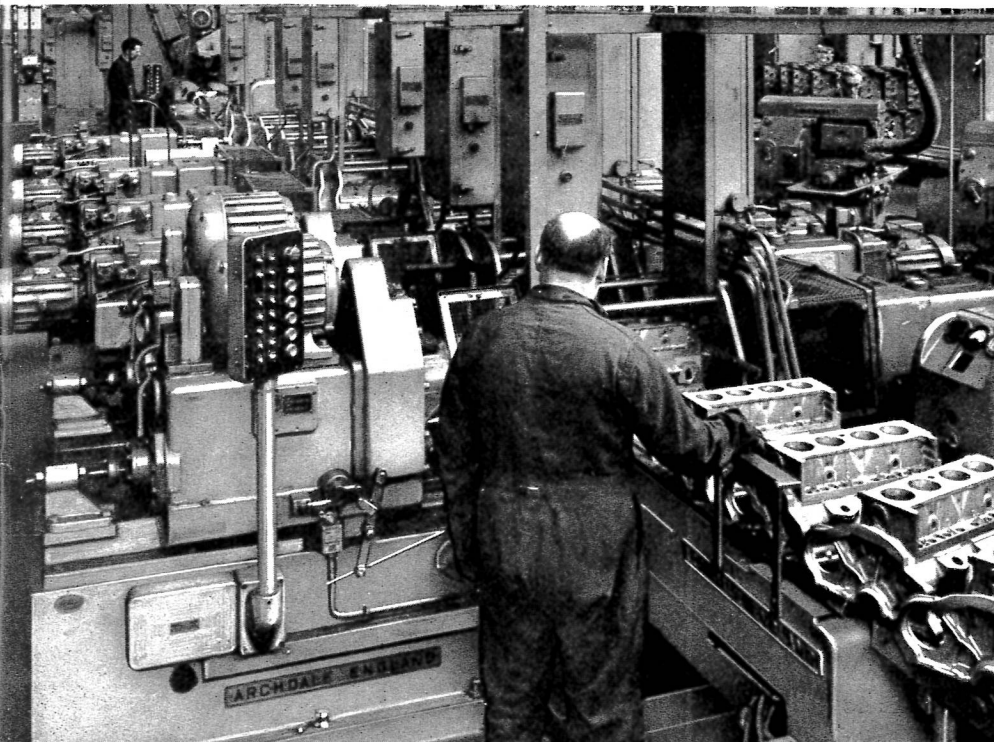


## PRODUCTION

As stated earlier, the Stoke Factory is responsible mainly for the production of mechanical units for passenger cars, but in the case of engines it also builds these for Commer and Karrier commercial vehicles. Each major unit is built in a self-contained department laid out on modern flow-line principles, so that material entering at one end progresses along the lines of machine tools where it is converted into finished components, then to the "final" line where the unit assembly is built up.

The many thousands of working parts demand a vast array of the latest machine tools, some of which are of the general purpose type, but the majority are designed to carry out one specific task.

*Cylinder blocks passing through an 8-station automatic transfer machine controlled by a single operator. The machine drills and countersinks cylinder blocks at the rate of 42 per hour, and it automatically gauges the depth of holes.*



*Double Head Grinder for Hillman Minx connecting rods. The machine has two 30-h.p. motors driving two 20 in. diameter wheels and the rotary work table carries 18 magnetic holding fixtures, each taking two components. It embodies automatic release of current for loading and unloading and automatic compensation for grinding wheel gear. It rough grinds large and small end faces at a rate of 133 per hour.*

In order to keep the machines in a state of high efficiency, the tool reconditioning department is kept fully occupied. The tools are withdrawn from production and replaced on a rota basis, and a complete spare set of tools is kept in stock as a guarantee that no matter what might befall, continuity of work in the machine shops shall not be interrupted.





*A general view of the Assembly Line for light four-cylinder engines showing the track of moving pedestals each supporting a universal head on which the engine is actually assembled.*

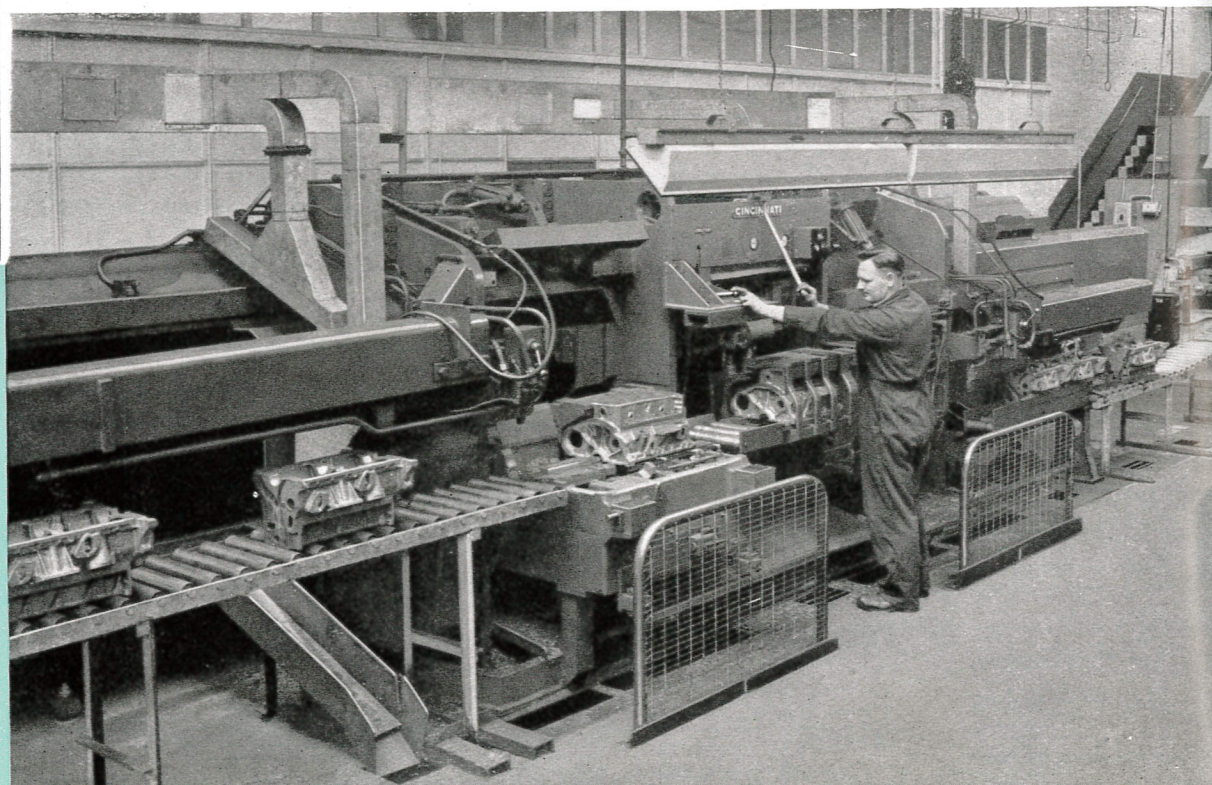
connecting rods pass automatically through a sequence of operations to emerge as fully machined units. This automatic movement achieves consistently high standards of quality while requiring the minimum of supervision.

## GEARBOXES AND AXLES

The gearbox and axle shops are situated side by side and here again there is a great array of costly machine tools in operation. The very latest equipment is installed for cutting the teeth on the gears, whilst in the finishing process extreme care is observed to ensure that quiet running shall be secured.

To make absolutely sure that there is no distortion when the gears are being hardened, strict control of grain size of the metal used is insisted upon, which, although it may involve higher cost, ensures the maximum degree of satisfactory service being obtained from the gearbox and rear axle.

*Cylinder blocks being machined on a special Cincinnati two-way horizontal broaching machine. It is 45 feet long, weighs 58 tons and is powered by six 30 h.p. motors. Under the control of a single operator, it deals with 47 cylinder blocks each hour.*



## ENGINE SHOPS

The different engines fitted to the various makes and models are divided for convenience of manufacture into two groups viz. (1) light range, (2) medium and heavy range.

The factory laid out for the first group, which includes Hillman, Sunbeam and Singer cars as well as small Commer Vans, is probably one of the most up-to-date plants of its kind in Britain today. It has a productive capacity of 4,000 engine units per week.

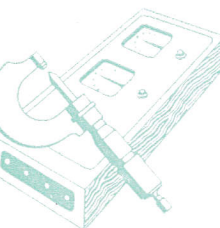
The plant includes some of the most modern transfer machines where components such as cylinder block, cylinder head and



## QUALITY CONTROL

Once the desired standard of quality has been achieved in prototype build, the next step is to ensure that these standards are rigidly maintained when components are being machined in tens of thousands for production.

*The size of pistons is checked on Sigma equipment, and automatically stamped on the piston crown.*



To this end, in addition to the normal inspection procedure, the various Rootes Group plants are equipped with elaborate automatic checking devices which obviate much of the human element.

In the light car engine plant, for instance, Sigma equipment checks the dimensional accuracy of components such as camshafts, crankshafts, pistons and connecting rods. Each dimension to be gauged is represented by a separate column of fluid which rises or falls on a chart according to the degree of accuracy of the component, a measurement of .0001 in. being equivalent to a fluid column 2 in. high.

Other similar machines measure pistons, gudgeon pins and cylinder barrel bores, so that these are graded to ensure the best mating fit between parts. The piston grading machine automatically stamps the correct grading on the piston crown.

These are not spot checks but are carried out on 100 per cent. of the volume.

*This shows the type of machine used to determine the dimensional accuracy of camshafts. The checks are carried out on a statistical basis to a pre-determined percentage of the total volume produced.*





## UNIT TESTING

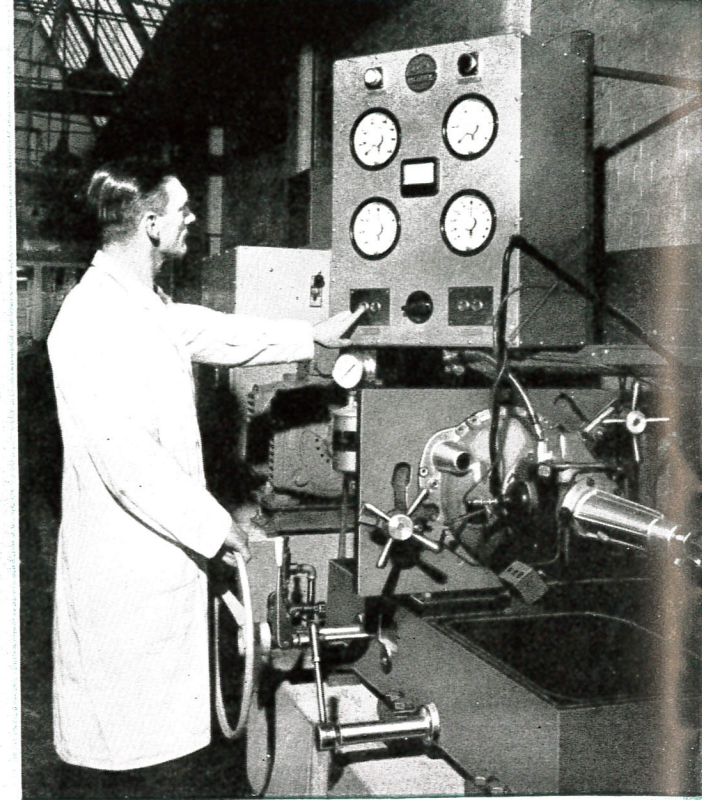
Following on from the control of accurately produced components, the next logical step is to establish the quality of the resulting assemblies, and the equipment for carrying out such a proving programme forms an integral part of each assembly line.

In the engine plants every engine is run for at least one hour on a back-to-back test, so called because engines are coupled together in pairs, one driving the other. This test reveals quietness of operation, tightness of components and provides an initial bedding in.

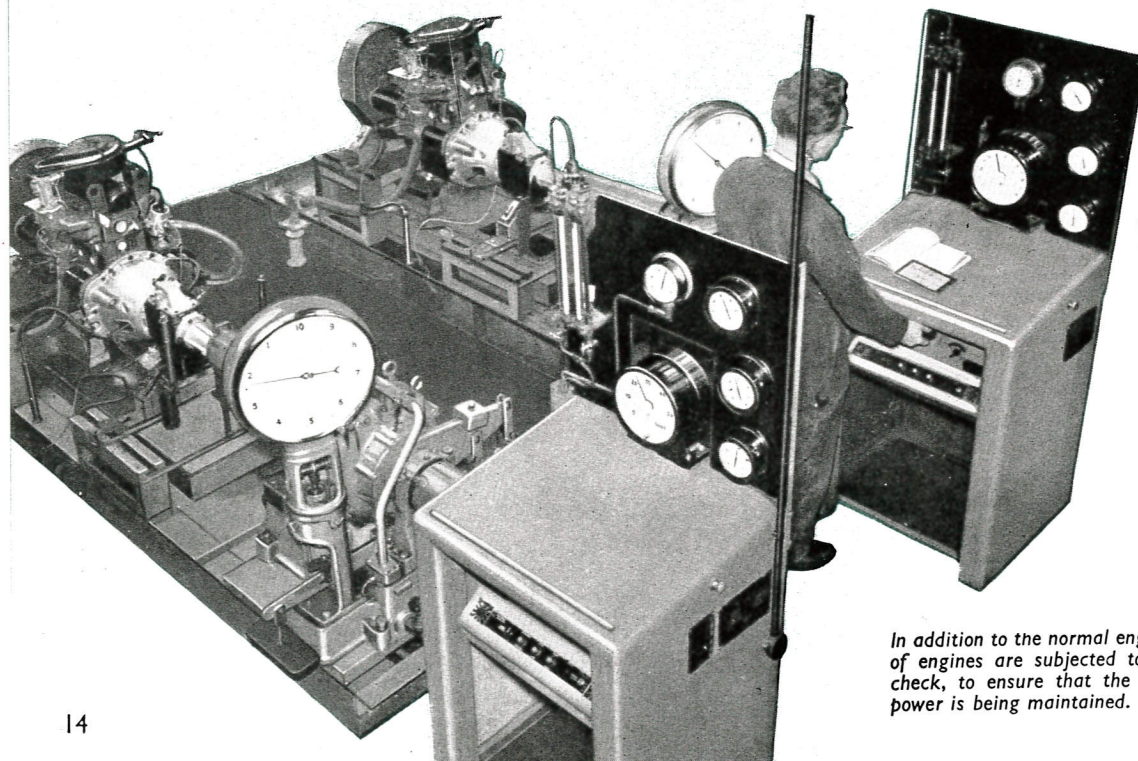
In addition, a number of engines, the quantity varying between  $2\frac{1}{2}$ –10 per cent. according to model, are given a full dynamometer test to confirm power output and economy.

A secondary but nevertheless important aspect of these tests is that the engines are fed continuously under pressure with oil far in excess of their requirements, to eliminate initial pick-up between moving components and to ensure a perfectly clean unit.

In the gearbox assembly, the main emphasis is upon silence of operation, and electronic test equipment is used to assess the level of noise under a wide variety of conditions. The normal practice is to



*Electronic test equipment being used in the gearbox shop to determine the noise level of gearboxes passing from the assembly line. The machine accepts or rejects these units depending on how they conform in each gear to the acceptable noise level for a normal assembly.*



*In addition to the normal engine test, a percentage of engines are subjected to a full dynamometer check, to ensure that the specified brake horse power is being maintained.*

obtain a noise value for each of the gears when operating at a known speed and under a known load, the assembly being passed off only if all the values fall within a range previously determined by experience with quiet running gearboxes.



## BODY PRODUCTION

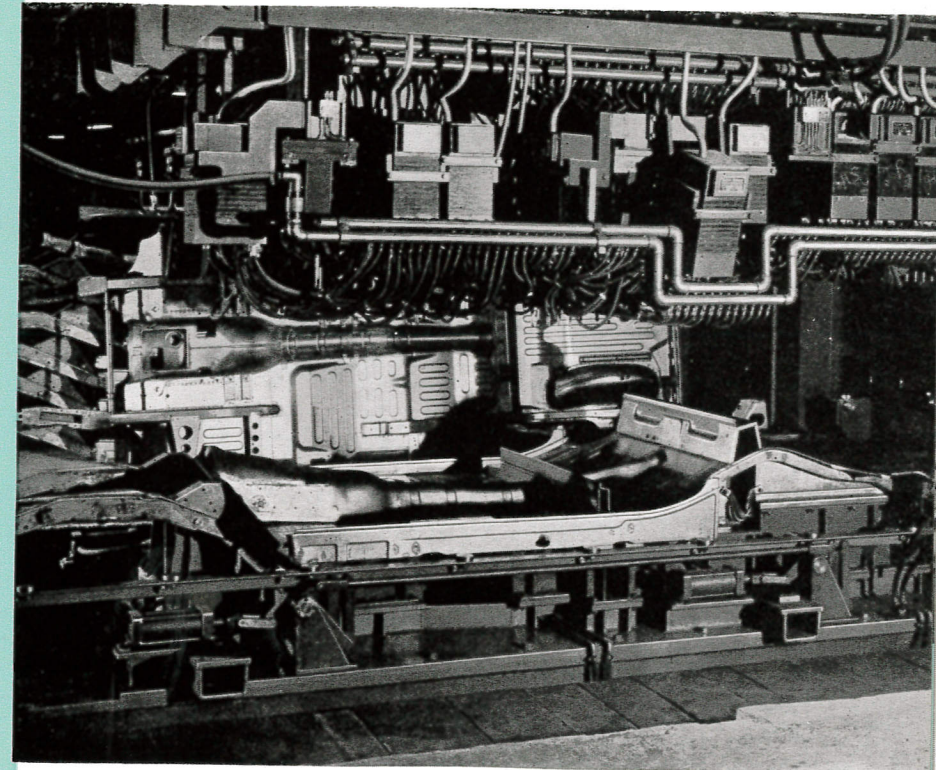
The fabricating of all-steel car bodies and truck cabs, as carried out at British Light Steel Pressings, is a highly developed science calling for wide experience and a large amount of expensive plant.

In fact, the factory has been re-planned and re-equipped with the very latest type presses, welding equipment and assembly equipment, so that body production is conducted in line with the most up-to-date technique.

Typical of the type of equipment involved are some of the latest British Clearing presses. There are single and double action presses capable of producing some of the largest pressings in the country.

The multiple spot welders, too, handle the most complicated assembly with ease. In the case of the Humber Hawk, the complete floor assembly passes through a battery of three

*A line of modern presses specially designed for the quantity production of auto body panels.*



*A typical modern press welder for producing Humber Hawk floor and understructure assemblies.*



welding presses receiving a total of 636 spot welds in a few seconds. These presses are hydraulically operated at a pressure of 800 lb. per sq. in., and controlled from a master panel which allows the welding sequence and cycle to be adjusted.

From the time the sheet metal enters the factory all sequences are carried out on the flow-line principle. Several hundred tons of steel sheet are cut to size on rotary shears or guillotines, and are passed through a variety of press operations—drawn to shape, flanged, trimmed and pierced. The completed pressings are transferred to the Stores in specially designed pallets and from there issued as desired to the Assembly Lines.

A system of close inspection is carried out at each stage of fabrication to ensure a reliable and soundly finished product.

Before despatch, all bodies and cabs are protected against corrosion during transport and storage, either by primer painting or by being passed on a conveyor through a specially designed oiling plant.

## BODY PAINT SHOPS

From B.L.S.P. the finished all-steel car bodies are transported to the Stoke factory, loaded onto conveyors and passed into the paint shop where the most exacting standards of control are rigorously maintained.

Each body is thoroughly cleaned to remove all traces of grease, and a coating of phosphate is applied to afford protection against corrosive attack. The lower part of the structure, including the more inaccessible inner box members, is then dip-primed.

From there, the body progresses through a continuous system of spray booths and ovens where the primer to the finish colour coats are applied, and baked to give a hard, durable enamel finish.



*It will be seen that the Humber Hawk body is held rigid in heavy assembly jigs, whilst the sequence of welding operations is carried out.*