

C. F. DINGWALL.

Trojan

SOLID ~ TYRED
UTILITY CAR

BRIEF SPECIFICATION

PROPERTY OF THE
ROYAL AUTOMOBILE CLUB LIBRARY
NOT TO BE TAKEN AWAY

ENGINE. Two-stroke four-cylinder engine: water-cooled; bore 2½ ins., stroke 4½ ins., Treasury rating 10 h.p. (£10 tax).

PROPORTIONATE LUBRICATION. The engine is lubricated by putting a certain quantity of oil in with the petrol, the correct proportion being assured by a simple device. The oil is pumped continuously to all the bearings without the use of valves or a separate pump.

IGNITION. Coil and accumulator.

LIGHTING. Dynamo.

GEARS. The change-speed gear is epicyclic, two speeds forward, one reverse; operated by gate-controlled lever and clutch-pedal. Ratios: top, 4-1; bottom, 12-1; reverse, 16-8-1. With engine revolutions at 1,000 per minute, the top gear gives 20 m.p.h.

BRAKES. Two independent brakes are provided, one acting on the transmission shaft and the other on the rear axle. In emergency, the epicyclic reverse gear is also available.

SUSPENSION AND SOLID TYRES. The ingenious combination of careful weight distribution with the use of long cantilever springs of special construction fitted both to front and rear axles, together with other novel features, makes the use of solid rubber tyres a practical and comfortable proposition.

FRONT AXLE AND STEERING. The front axle is of tubular construction; the steering is on the Ackermann system, the steering column being at a comfortable angle. The reduction is of the spur and pinion pattern, enclosed and working in oil.

REAR AXLE AND FINAL DRIVE. A single duplex chain transmits the power to a differential-less axle shaft, which drives both wheels. This shaft runs on ball bearings and is completely enclosed.

ROAD WHEELS AND TYRES. Single-disc wheels. Solid tyres.

BODYWORK. The body seats four people. A two-piece glass wind-screen, side-screens, and a folding hood with side curtains are part of the standard equipment.

EQUIPMENT. A serviceable set of tools and tool-boxes is included, also a licence holder.

EXTRAS. The following extras suitable for the car can be supplied: speedometer, clock, spot-light, driving-mirror, inspection lamp, screen-wiper and pedal covers.

PRINCIPAL DIMENSIONS. Wheel-base, 8 ft. 0 in.; track, 4 ft. 0 in.; overall length, 11 ft. 0 in.; overall width, 4 ft. 10 ins.; weight, 12½ cwt.; ground clearance, with normal load, 9 ins.

GUARANTEE. The complete car is guaranteed against faulty workmanship and material for a period of six months, in accordance with the Terms of Business printed below.

NOTE.—The engine, lubrication system, flexible-coupling, starter, gearbox, change-speed gear control, suspension system, disc wheels, part of the ignition system, priming device, and reserve petrol provision, &c., are all protected by patents.

TERMS OF BUSINESS AND GUARANTEE.
(TROJAN UTILITY CAR).

1.—GENERAL. The following are the conditions which apply to all orders given to and accepted by Leyland Motors, Limited, for Trojan Utility Vehicles. The Company does not hold itself responsible for any conditions other than those hereafter mentioned in accordance with the sale, &c., of its productions.

2.—PRICES. Quoted prices are based on the Company's current lists and are subject to alteration without notice. They are for delivery at Kingston Works, Surrey. The terms of payment are £10 with order, and the balance of purchase money when the buyer has been advised that his chassis is ready for delivery. Only the Company's receipt or that of its accredited agents will be recognised for all deposits paid to the Company or its agents respectively.

3.—TIME FOR DELIVERY. The Company undertakes to make every endeavour to execute each order within the time promised, but is in no way liable for delays in delivery, or for circumstances arising from such delays, due to strikes, lock-outs, trade disputes, accidents, fires, Government action or other abnormal or unforeseen circumstances.

4.—IMPROVEMENTS AND ALTERATIONS. The Company reserves the right to carry out alterations and improvements in design or methods of manufacture from time to time without further notification. Any such alterations shall not affect the validity of any customer's order.

5.—LIABILITY. Unless otherwise provided for, it is a condition that the Company and its agents shall not be liable for any direct damage or loss, either consequential or direct, that may arise after the customer has been notified that the vehicle is ready for delivery.

6.—GUARANTEE. The following guarantee is given and no other guarantee or warranty whatsoever is given or is to be implied:—

All goods are supplied and guaranteed to the original registered private user against defective workmanship and/or material, exclusive of coachwork or accessories not of the Company's manufacture, for a period of six calendar months from date of invoice.

The Company is prepared to supply, free of charge at Works, the necessary replacements for any part which may be proved faulty as above. This guarantee is limited to the supply of new parts or to the repair of defective parts. It does not imply the assumption of contingent liability, nor shall it form the basis of a claim for labour or other expenditure arising, nor shall the Company be liable for any direct or consequential damages arising from such contingent liabilities.

This guarantee does not apply to defects caused by racing, wear and tear, dirt, misuse, neglect, nor to defects in any motor, motor vehicles or goods, the identification numbers or marks on which have been altered or removed.

The Company reserves the right to defer consideration as to whether it can accept liability in any individual case of claim under the Guarantee until the defective part has been returned, clearly identified, and carriage paid, to the Service Department, Leyland Motors, Limited, Kingston, Surrey, or as may otherwise be directed, for examination and report.

7.—DEFAULT BY PURCHASER. If the buyer make default in any payment, or become subject to the bankruptcy laws, or make an assignment for the benefit of his creditors, or make any composition with his creditors, or, if the buyer be a Company which goes into liquidation whether voluntarily or compulsorily, the Company may, at its option, cancel any contract with such buyer, any deposit that has been paid to the Company becoming forfeit.

8.—ARBITRATION. Any disputes on the contract, arising on the question of construction, to be settled by arbitration in London or Leyland, each party to appoint an Arbitrator, and the two so appointed to appoint a third, the decision of any two to be binding. If either party fail to appoint an Arbitrator within 21 days' notice in writing requiring them to do so, the Arbitrator appointed by the other party may act as sole Arbitrator.

9.—VEHICLES DRIVEN BY COMPANY'S STAFF. Customers' vehicles are driven by the Company's staff only at owner's risk and responsibility.

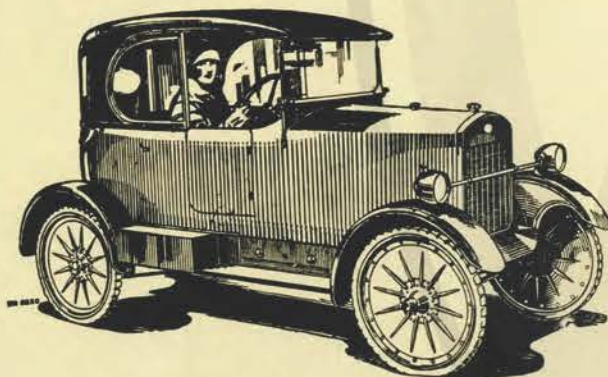
10.—EXHIBITIONS. All motor vehicles and parts thereof are sold under the condition that they are not to be exhibited nor allowed to be exhibited at any exhibition or collective demonstration in the United Kingdom of Great Britain and Ireland without the Company's previous written permission, other than any exhibition held by the Society of Motor Manufacturers and Traders, Limited, or approved of by that Society for exhibition of motor goods by its Bondsigners. It is hereby agreed that, in any case of any breach of the provisions of this clause, the buyer will forthwith pay to the Company a sum not exceeding £250 for every such breach as liquidated damages. Any sum due in respect of such damages may be assigned by the Company to anyone.

ALL PURCHASERS OF MOTOR VEHICLES OR GOODS FROM THE COMPANY SHALL BE DEEMED TO HAVE SO PURCHASED WITH KNOWLEDGE OF THE ABOVE CONDITIONS.

OCTOBER, 1924.

Leyland Motors
- Ltd -TROJAN FACTORY:
KINGSTON-ON-THAMES.
Telephone: 3010 Kingston.

P.F. 711



THE TROJAN CAR WITH DETACHABLE COUPÉ TOP
IN POSITION.

STANDARD Trojan Car,
complete with Lighting Set,
a two-piece glass Wind-screen,
Side-screens, Hood, Side-curtains,
Horn, Mats, Kit of Tools and
two gallons of petrol. Painted
Trojan Blue with Black wings.

£148 - 0 - 0.

Detachable Coupé Top to fit the
standard car. **£28 - 0 - 0** extra

PETROL CONSUMPTION—40 MILES PER GALLON.

Trojan

C. F. DINGWALL
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**GEARS AND
TRANSMISSION.**

The power is transmitted from the engine to the gearbox through spiral springs, set radially. This provides a smooth and flexible, though positive drive. An exceptionally easy gear-change is obtained by the use of epicyclic gear. A gate-change lever at the driver's right contracts the top, low speed, or reverse bands on to their respective drums. A clutch-pedal is, therefore, not essential, though one is fitted for convenience. The engine gives such a high torque at low speeds that hills with a gradient of 1 in 8 can be climbed, with full load, in top gear which has a ratio of 4 to 1, while the emergency low gear (12 to 1) enables practically any hill to be negotiated without the slightest difficulty. The reverse gear has a ratio of 16.8 to 1. (A road speed of 20 m.p.h. represents an engine speed of 1,000 r.p.m. in top gear.) The drive is taken through a spur reduction gear, and thence by duplex chain to the solid back axle, where the absence of a differential not only helps the car to hold the road, but renders it less liable to skid and makes passage through deep snow and over soft ground possible. The enclosed axle shaft runs on ball-bearings.

**SUSPENSION
AND TYRES.**

Solid tyres, costing £7 10s. a set, are fitted. No sacrifice of comfort is entailed, owing to the exceptional design of the long cantilever springs fitted at both front and rear, in conjunction with a careful disposition of weight. Being widely spaced, and rigidly attached to the axles, they give great stability.

BRAKES. See brief specification.

FRONT AXLE AND STEERING. See brief specification.

BODYWORK. The body seats four people. A two-piece glass screen with side-screens, and a folding hood with side curtains, are standard equipment. The back of the car affords ample capacity for luggage, and a capacious cupboard under the dash, illuminated at will, is an additional convenience. The tail-lamp is completely enclosed behind a translucent number-plate, and is visible to the driver through a tell-tale.

CONTROLS. The hand brake and change-speed levers are placed at the driver's right hand, in proximity to the starting-lever, which also retards the spark for starting. All three levers are so arranged that they do not interfere with the off-side doorway. A detachable key, which fits a socket in the dash, acts as a master switch for the ignition and electric horn, and also forms the "main" and "reserve" petrol tap. To the right of the steering wheel is the mixture regulator. There are three pedals, actuating accelerator, foot-brake and clutch. A foot-operated pump primes the engine.

INSTITUTE



Trojan

Description of the Trojan.

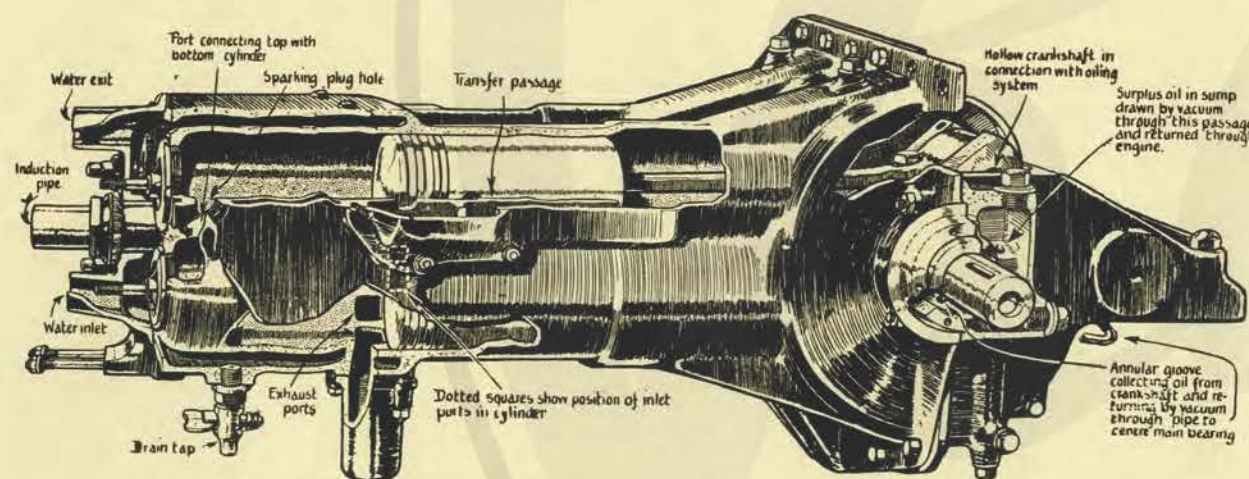
(A Brief Specification is given on page 6).

THE Trojan is a small utility car of substantial construction; its outstanding features are its simplicity, its reliability and the exceptionally low cost of running—the cost of tyres and petrol in particular. It has been designed on entirely novel lines with the particular object in view of eliminating, wherever possible, those components which in current and conventional practice have proved to give occasional trouble or to be expensive in maintenance. The Trojan requires the minimum of attention either on the road or in the garage; it is very easy to wash, and there are no polished parts. A great convenience, especially to doctors, is that the engine can be primed and started, the lamps lighted, and, if necessary, the reserve of petrol brought into use—all from the driver's seat.

CHASSIS. Strictly speaking, the Trojan chassis does not incorporate a frame, its place being taken by a light steel pressing (known as the "punt") which provides enormous strength, in addition to constituting an effective undershield.

ENGINE. The Trojan engine, working on the two-stroke principle, is valveless; it is placed horizontally, with the cylinder heads pointing forward. The four water-cooled cylinders, which are cast monobloc, are internally connected in pairs, there being only two combustion chambers. The two crank-throws are set at 180° , and a central bearing is provided, housed in a web which divides the crank-case into distinct halves, in each of which identical operations take place.

An exceptionally high torque is obtained at low speeds, greatly facilitating driving in traffic and hill climbing. There are only seven separately moving parts, all of which can be removed as a complete unit after detaching the crank-case foot.



THE TWO-STROKE FOUR-CYLINDER ENGINE OF THE TROJAN UTILITY CAR, PARTLY CUT AWAY TO SHOW THE INTERNAL DETAILS.

SEQUENCE OF OPERATIONS. In order to understand fully the working of the engine, it is better to consider only one side (*i.e.* one pair of cylinders and the corresponding half of the crank-case) at a time. At the moment of maximum compression, with the pair of pistons at the inner limit of their stroke (*i.e.* close to the cylinder head), the gas is fired in the common combustion chamber and the pistons are forced towards the crank-case, the lower one leading slightly, owing to the angularity of the connecting rods. Before reaching the limit of its travel, the head of the lower piston uncovers the exhaust port (which communicates with the lower cylinder only) and the gas flows out. The head of the upper piston then uncovers a port (the "Transfer Port") which

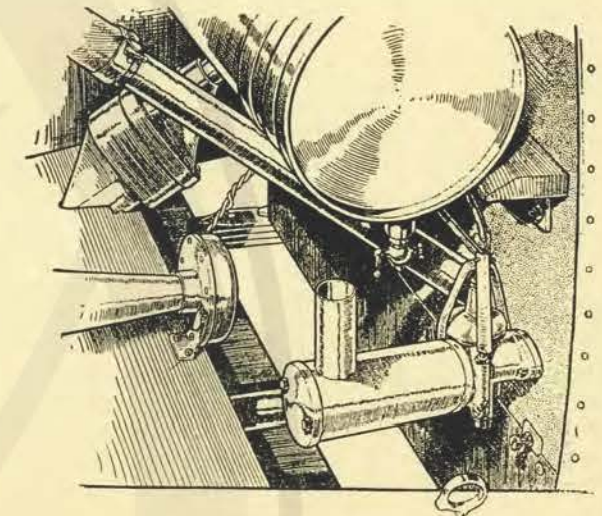
opens a passage between the upper cylinder and the crank-case, in which a fresh charge has been compressed by the descending pistons. This gas is thus pumped into the upper cylinder and thence through the combustion chamber, driving the exhaust gases from both cylinders. As the pistons recede, three operations take place. (1) The lower piston closes the exhaust port. (2) The upper piston closes the transfer port. (3) The skirt of the upper piston uncovers the inlet port, leading from the induction pipe to the crank-case, where the receding pistons have created a partial vacuum which induces a fresh charge of explosive mixture from the carburettor.

Owing to the lead which the lower piston possesses over the upper, and owing to the small communicating passage between the two cylinders, a state of turbulence is maintained in the combustion chamber, so that when the firing point is reached, flame propagation is extremely rapid.

IGNITION. See brief specification.

LIGHTING. See brief specification.

LUBRICATION. Lubrication is based on the petrol system, but in a new form which effectually removes the old-standing objection, namely, that of imperfect oil circulation. The oil is contained in the same tank as the petrol, the correct proportion—3 per cent.—being ensured by a special measuring device. After passing through the carburettor, whence it issues in the form of fine spray, the oil is carried along the induction pipe, and is admitted, with the explosive mixture, into each side of the crank-case alternately, as the respective inlet ports are opened. Being heavier than the petrol mixture, the oil falls to the bottom of the crank-case. The internal circulation of the oil is effected by the states of partial vacuum and pressure alternately existent in the two halves of the crank-case. The forward travel of one pair of pistons forces the oil through a strainer and sump to the main bearing of the opposite half of the crank-case, where a partial vacuum simultaneously assists its progress into the hollow crank-shaft. Centrifugal force throws the oil along the hollow webs, whence it lubricates the big-end bearings, splashes the cylinder walls, drains to the sump, and is thence fed back, in a similar manner, to the other main bearing. The principal advantage of this lubrication system over that employed in other modern automobile engines is that an ideal proportion of oil to petrol is maintained, depending, not on the speed of the engine, but on the load.



UNDER THE BONNET. THE PETROL TANK, HORN, STEERING BOX, AND CARBURETTOR WHICH IS FITTED WITH AN AIR MUFFER TO SILENCE THE AIR-INTAKE.

PETROL SYSTEM AND CARBURETTOR.

Placed under the bonnet, and shielded from the engine by a steel partition, is the petrol tank with a capacity of seven and a half gallons. A patented device retains one gallon of this as a reserve, instantly available from the driver's seat, and prevents chance water or dirt or undissolved oil from reaching the carburettor. The latter, which is also shielded from the engine, has been specially designed for the Trojan, and gives a practically constant air-petrol mixture under all conditions, without employing moving parts subject to engine suction and consequent wear. Even after dismantling, there are no parts requiring accurate adjustment. A variable jet, operated from the dash, permits the correct setting for any climatic conditions, and, with the exception of the pedal accelerator, is the only engine control. A muffle, fitted to the air-intake, reduces the noise, acts as an air filter and prevents loss of petrol due to blow-back. The mixture passes down the induction pipe, through a passage surrounded by the hot water-jackets, and impinges on a hot plate which deflects it, through the inlet port, into the crank-case. Due to this arrangement, the separation of the petrol from the oil is completed.

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