The 21 h.p. 6-CYLINDER LANCHESTER

DESCRIPTIVE MANUAL.

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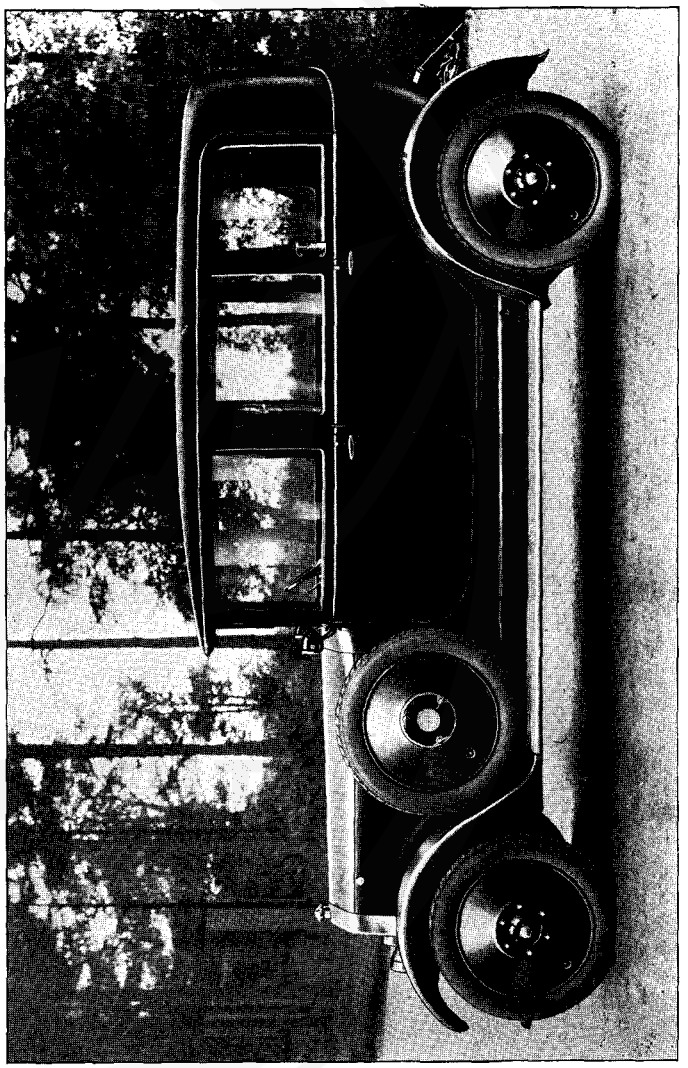
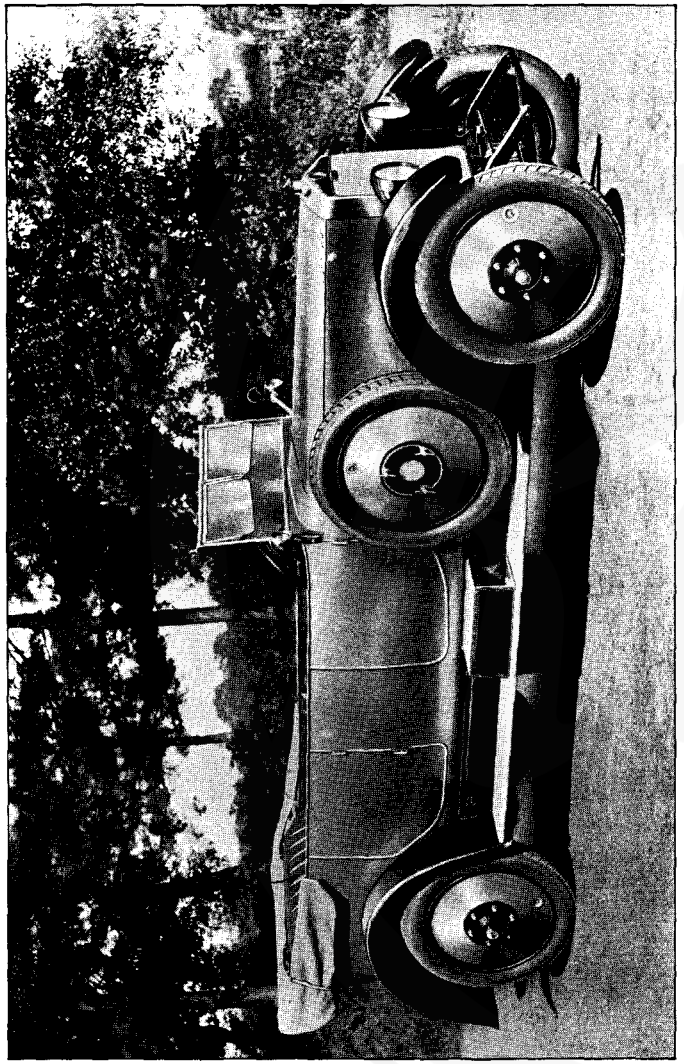


21-h.p. 6-Cylinder Lanchester 6-Seat Enclosed Drive Limousine.



21-h.p. 6-Cylinder Lanchester 4-Seat Touring Car.

21 h.p. Descriptive Manual.

PREFACE.

DURING the past few years much has been written and said regarding the requirements of the Owner Driver, and it is claimed for many chassis that they are "specially" designed to meet the requirements of the Owner who looks after his own Car.

In the majority of instances a closer acquaintance with these chassis reveals the fact that the claims are totally unfounded and that the term "The Owner Driver's Car" is nothing more than a selling slogan.

Contemplated from a logical standpoint the requirements of the Owner Driver are precisely those of the professional Chauffeur. Advantages such as simplicity and accessibility of lubrication points, easy accessibility of petrol and oil fillers, opening and closing of same without resorting to the use of tools, access to mechanism that requires adjustment periodically, are just as desirable to the Chauffeur as to the Owner, and it pays the Owner to consider his Chauffeur's requirements, as he would his own.

It can be safely stated, and is abundantly proved in the following pages, that the 21 h.p. Lanchester possesses to a greater extent than any other Car the features and qualities desired by the present day Motorist, whether Owner or Chauffeur. The utmost care and consideration has been exercised in its design, and, as in its prototype, the 40 h.p. Car ; neither labour nor expense is spared in the production of it.

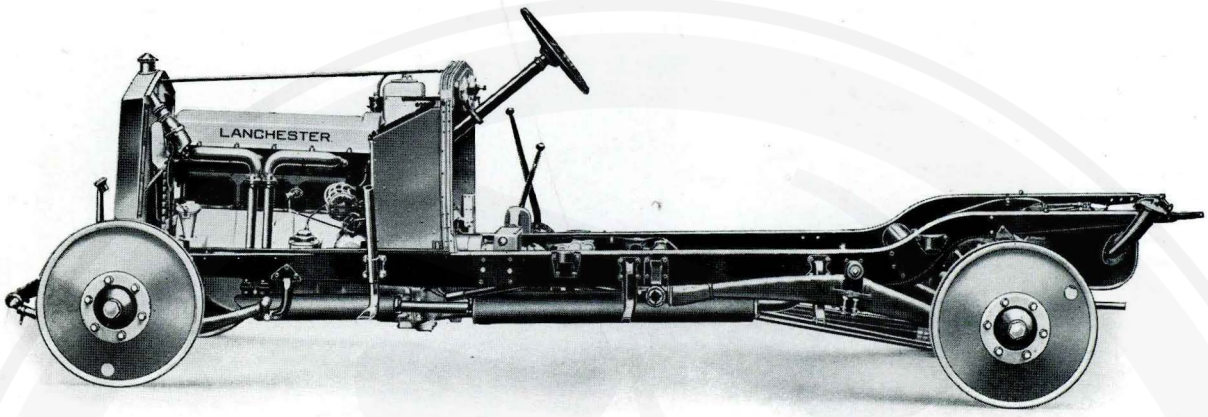


Fig. 1. Side Elevation Chassis

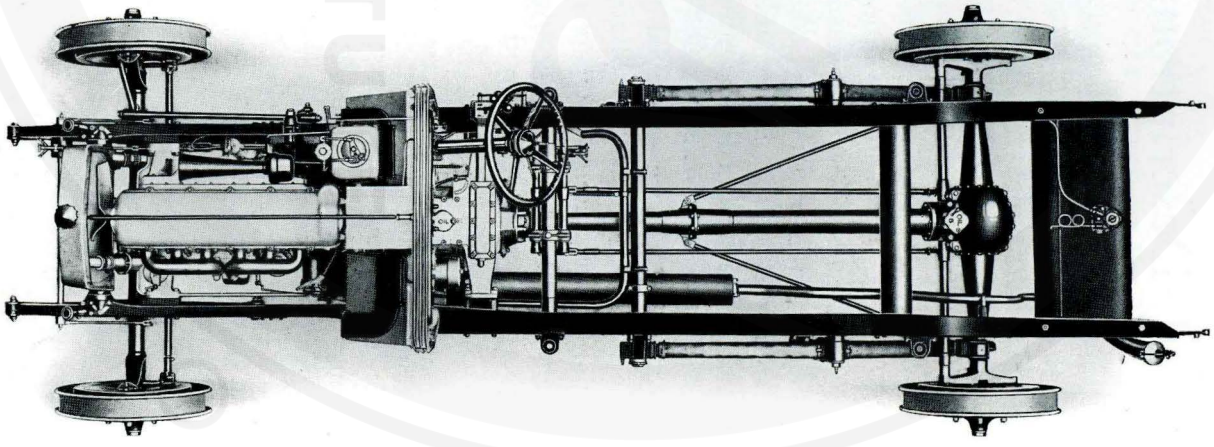


Fig 2 Chassis Plan View.

General Description.

The Chassis Figs. 1 and 2, throughout is built on similar lines to that of the " 40," the frame members being wide and deep channels, connected transversely by strong tubular members, a feature of Lanchester Cars from their inception, making an exceptionally rigid structure. The rear suspension is of Lanchester cantilever type, half elliptic springs being employed for the front axle. The final transmission is by Lanchester silent worm gear within an axle of similar design to that of the "40." Brakes are provided on all four wheels and the front axle is of tubular construction to resist the torsional loads imposed by front wheel braking. Disc wheels are employed to enable the front brakes and steering pivots to be disposed within the wheel, and approximately in the plane of the wheel track, a precaution which, in adopting Front Wheel Brakes, we consider essential in the interests of safety.

Power Unit. Following the practice originated by the Lanchester, and now almost universally employed, the engine and gear box are built up as a unit, and the possibility of imperfect alignment between the crank shaft and gear shaft and necessity for universal joints connecting them is entirely eliminated.

The Engine has six cylinders cast monobloc, 3·1″ (78·8 m.m.) bore × $4\frac{1}{2}$″ (114 m.m.) stroke, treasury rating 23 h.p. It has a detachable cylinder head, overhead valves operated by an overhead cam-

shaft worm driven, totally enclosed and automatically lubricated. High pressure forced lubrication, magneto ignition, 4-jet automatic spray carburettor water jacketed, and water jacketed induction pipe branch. The water circulation is by centrifugal pump, a Thermostat valve controlling the temperature. The electric generator is designed integral with the engine and is worm driven.

The Gear Box has 4 forward speeds and one reverse. It is of the orthodox sliding change type, but is of stiff and compact design, which combined with accurately ground gear teeth renders the gears exceptionally silent. The gear ratios are:-

1st gear	4	: 1.
2nd „	2.4	: 1.
3rd „	1.6	: 1.

and top gear direct, by dog clutch. The reverse ratio is 3.4 : 1. All gear shafts run on ball bearings, excepting the reverse, which runs in white metal bushes immersed in oil. The reverse shaft is entirely out of engagement when all other gears are in use.

The Steering Column is adjustable for height. Three positions being provided for. All Pedals, Clutch, Brake and Accelerator are also adjustable to suit the requirements of individual drivers. The steering wheel is of large diameter and carries the control levers for Ignition, Carburettor and Air.

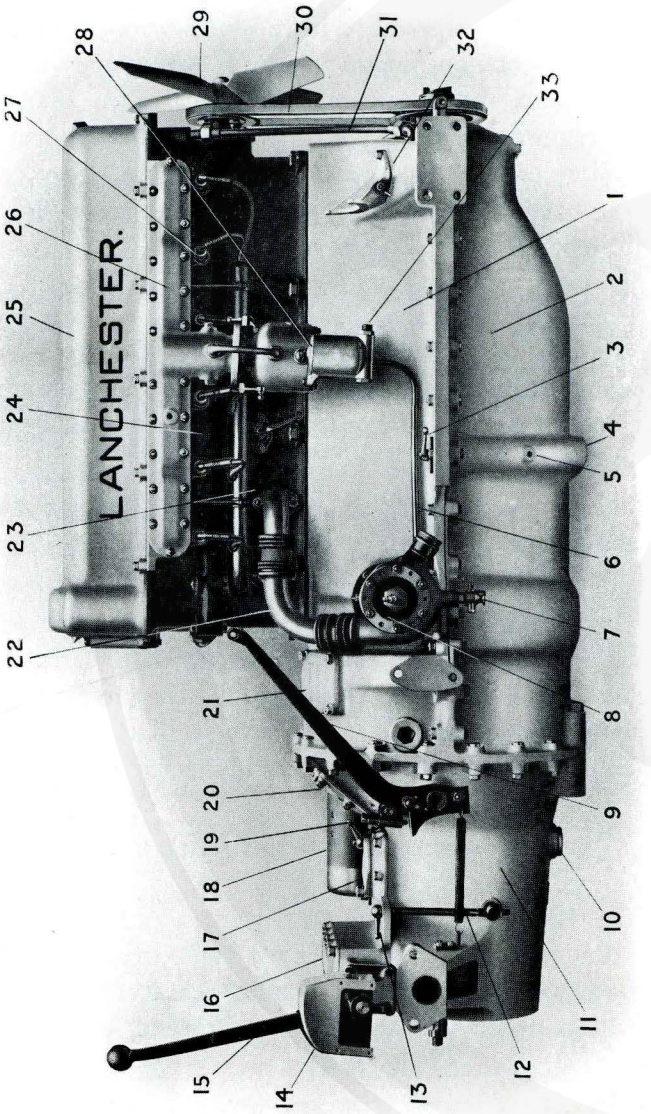


Fig. 3. Power Unit.

Detail Description.

Engine. As already mentioned in the General Description, the engine Figs. 3, 4 and 5, has six cylinders cast Monobloc with detachable head, which may be removed without disturbing the overhead valves and camshaft. The combustion space is partially spherical in form and entirely machined, a process contributing to efficiency and evenness of running. The overhead valves and camshaft are totally enclosed by a detachable aluminium cover. Two exhaust manifolds of ample diameter are provided, each serving three cylinders. The water circulation is by centrifugal pump and its temperature is controlled by a thermostat which chokes the circulation until the water is raised to a suitable temperature.

Description of fig. 3.

1 Crankcase.
2 Oil Base.
3 Crankcase Oil Level Cock Handle.
4 Crankcase Oil Drain.
5 Crankcase Oil Level Cock.
6 Carburettor Jacket Water Circulation Pipe.
7 Water Drain Tap.
8 Water Pump.
9 Clutch Pedal.
10 Gear Box Oil Drain Plug.
11 Gear Box.
12 Clutch Pedal Spring.
13 Gear Box Oil Level Cock.
14 Gear Change Gate.
15 Gear Change Lever.
16 Gear Change Selector Box.
17 Gear Box Oil Filler.
18 Engine Starter.
19 Clutch Stop.
20 Inspection Cover.
21 Valve Timing Inspection Lid.
22 Water Circulation Pipe.
23 Cylinders.
24 Detachable Cylinder Head.
25 Valve Cover.
26 Induction Manifold.
27 Sparking Plugs.
28 Carburettor.
29 Cooling Fan.
30 Fan Driving Belt.
31 Oil Return Pipe.
32 Electric Horn Bracket.
33 Petrol Union.

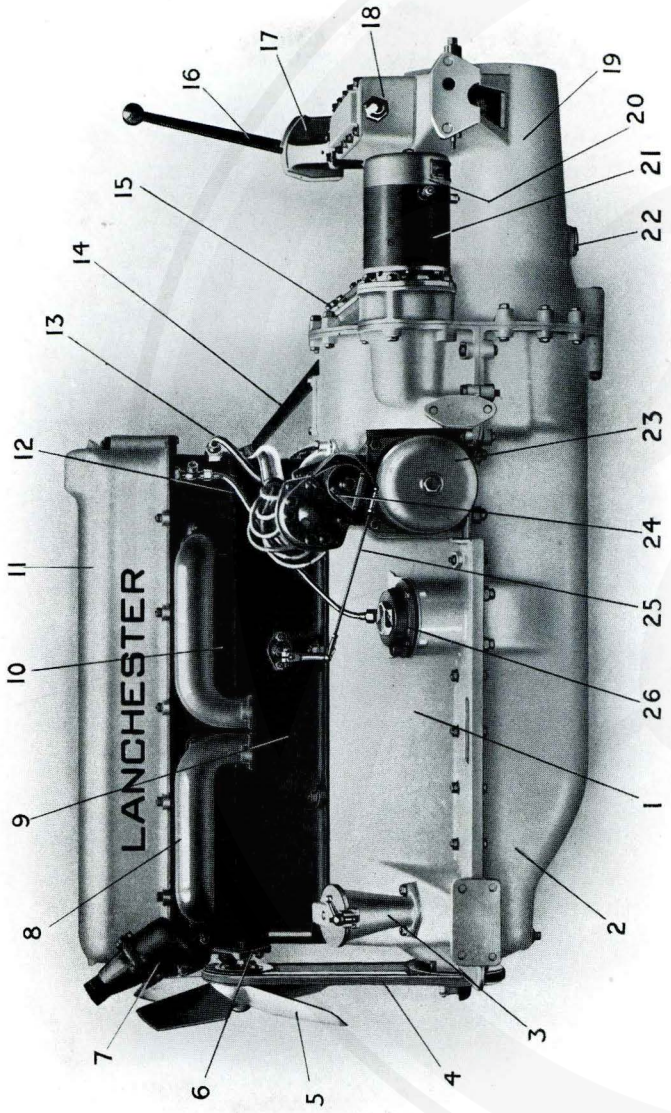


Fig. 4. Power Unit.

Crankcase. Both the crankcase and the oil base are of deep section combining to form a stiff girder-like construction, the strength of which is greatly increased by employing wide flanged crankcase joints and a large number of bolts securing them to each other. The engine is supported in the chassis by bearer brackets cast integral with the crankcase and gear box. Mounted on the near side bracket at the forward end of the crankcase is an oil filler of large diameter Fig. 4 ; no tun-dish is required for filling, and the oil filler lid being hinged and secured with a wing nut, no tools are necessary to open it. Towards the rear of the crank-case on the nearside is situated an oil filter, the gauze of which can be removed for cleaning or replace-ment without loss of oil. An overflow cock indicating the correct oil level (also for use in the event of over filling) is provided on the offside of the engine. *For lubrication instructions see page* 39.

Description of fig. 4.

1 Crankcase.
2 Oil Base.
3 Crankcase Oil Filler.
4 Fan Driving Belt.
5 Cooling Fan.
6 Fan Belt Adjustment.
7 Thermostat.
8 Exhaust Manifold.
9 Cylinders.
10 Detachable Cylinder Head.
11 Valve Cover.
12 Oil Pressure Pipe.
13 Oil Return Pipe.
14 Clutch Pedal.
15 Inspection Cover.
16 Gear Change Lever.
17 Gear Change Gate.
18 Gear Change Selector Box.
19 Gear Box.
20 Starter Commutator and Brush Cover.
21 Engine Starter.
22 Gear Box Oil Drain Plug.
23 Dynamo.
24 Magneto.
25 Timing Link.
26 Oil Filter.

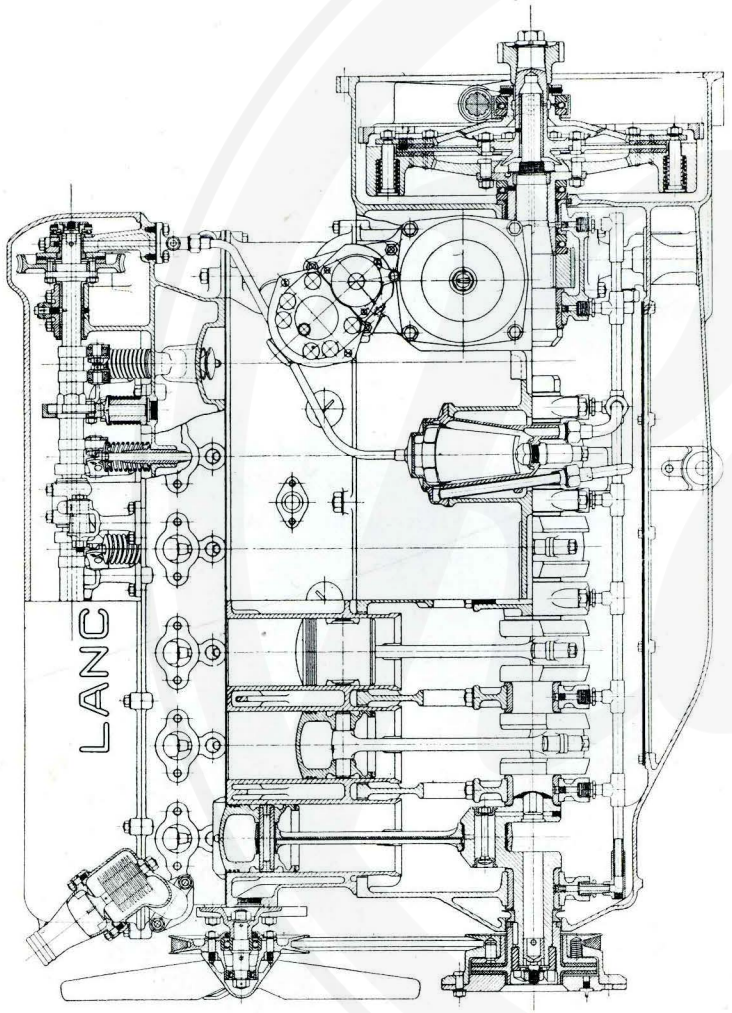


Fig. 5. Power Unit in Part Section.

The Crankshaft Fig. 6 (overleaf) is of exceptionally robust design, its six throws being supported by a bearing between each pair. There are eight bearings in all, the main bearing nearest the flywheel being divided to accommodate the cam transmission worm which runs in an oil bath. The crank is of hollow formation, the shaft and crank pins being bored to effect a saving in weight ; suitable oil conduits are drilled for the distribution of oil which is pressure fed. The main bearings are of special anti-friction metal.

The Pistons Fig. 7 are aluminium alloy, die cast, this material having been adopted by us in 1919, after tests extending over five years. Four piston rings are employed, one at which is placed at the foot of the skirt and acts as an oil scraper, preventing over lubrication and resultant carbon deposit in combustion space. The groove into which this ring fits is drilled with holes through which the surplus oil drains away. The gudgeon pin is floating, i.e., neither fixed to the piston nor to the connecting rod ; it is tubular in form to save weight ; the ends are provided with aluminium

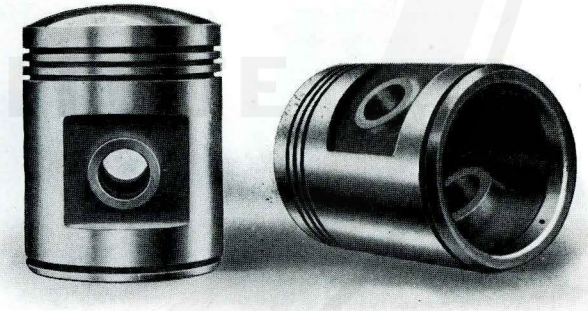


Fig. 7. Pistons.

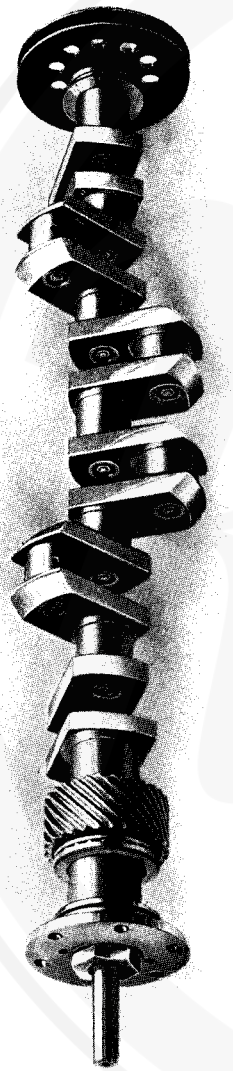


Fig. 6. 21-h.p. Crankshaft.

plugs having a slight curvature on the face conforming to the radius of the cylinder walls.

The Connecting Rods Fig. 8 are stampings in high tensile steel machined all over to a uniform weight. The big end is lined with a white metal bearing cast under pressure, a process which ensures effective adhesion of the white metal to the surface of the rod and a density of structure in the bearing metal giving great durability. The small end is bushed with a hard alloy phosphor bronze. Oil is conducted from the crank pin bearing to the small end bearing by means of a steel tube which is secured in the rod before the insertion of its bearings.

The Valves and Camshaft are located overhead. The valves are of special steel, selected for its corrosion resisting properties, and will run upwards of 15,000 miles without it being necessary to re-grind the seats. They are slightly inclined from the vertical and are operated from the centrally placed camshaft by rocker arms Fig. 9. The rocker arm for each valve has its fulcrum on the side of the cylinder head opposite to the valve. The fulcrum pin is carried on eccentrics, the purpose of which is to raise or lower the fulcrum, thereby adjusting the clearance between the tappet and

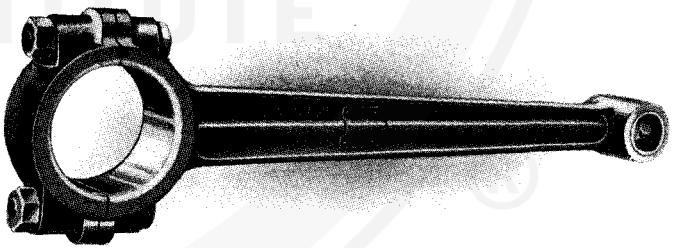


Fig. 8. Connecting Rod.

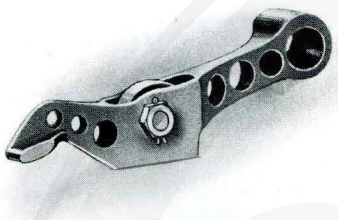
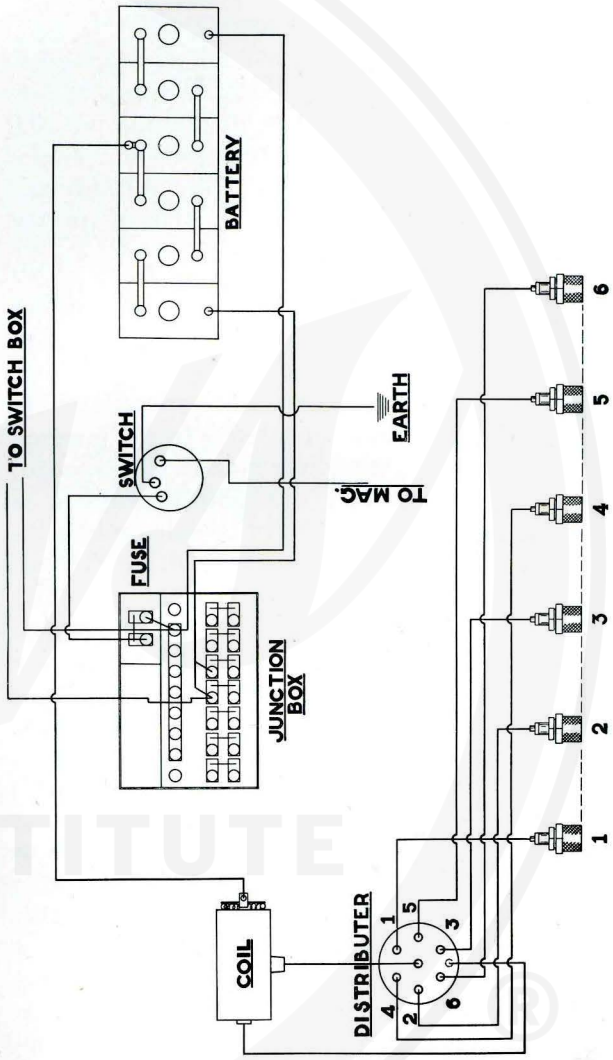


Fig. 9. Valve Rocker.

valve. Approximately central in the rocker arm is carried a roller on which the cam bears; the roller is sunk in a pocket, which forms an oil bath and ensures continuous lubrication of both the roller and its pin.

The camshaft, as previously mentioned, is situated centrally, i.e., longitudinally between the feed and exhaust valves. It is supported by four white metal bearings and is worm driven, through a vertical shaft located at the rear end of the cylinders, from a worm gear on the crankshaft. Towards the rear end of the camshaft is a six-faced cam against which a spring loaded plunger abuts. The function of this cam is to counterbalance the torque re-action of the valve cams.

Ignition is by Watford movable pole piece magneto located in an accessible position on the near-side of the engine. The magneto is chain driven from a sprocket on the cross shaft, which is driven by worm gear on the crankshaft. The order of firing is 1, 5, 3, 6, 2, 4, counting from the front of the engine. The high tension cables are connected to the sparking plugs by quick detachable insulated terminals, thus enabling the spark to be tested while the engine is running, by the naked hand without the use of tools.



21 H.P. BATTERY IGNITION WIRING DIAGRAM.

Order of Firing, 1, 5, 3, 6, 2, 4, counting from front of Engine.

The Carburettor. Fig. 10. The selection of carburettor in the 21 h.p. Lanchester car is the outcome of exhaustive Trials on the Test bench and on the road. All the leading types have been tried and the one selected as being most suitable is the Smith 4-jet Carburettor. It is a well-known type and requires no introduction.

It is a fully automatic carburettor of the simplest kind and comprises a water jacketed spray chamber at the base of which are 4 choke tubes combined in a cylindrical pedestal which intrudes concentrically into the spray chamber. The choke tubes opening radially communicate with the spray chamber through four rectangular ports, each port being arranged at a different height. The ports are covered by a cylindrical sleeve, which forms the automatic valve for controlling the jets. This sleeve, has an enclosed top and functions as a piston operated by the suction in the induction pipe ; the cavity within it forms a dashpot which prevents irregular motion. The four ports overlap each other ; the piston uncovers each in succession, so that before one is fully opened the next commences to open ; this ensures regularity of mixture throughout the entire range. The starting and slow running is provided for by arranging the piston valve so that it chokes the first port but does not entirely close it. It is notable that there is only one moving part—the automatic piston valve—the entire surface of which is continually washed by petrol spray, which keeps the surfaces free from dust and ensures free working of the valve under all conditions. The four jets, within the four choke tubes referred to above, are carried on a platform which is a part of the float chamber, and the jets and float chamber are readily detachable from the carburettor by removal of one nut

and disconnecting the petrol pipe. The normal jet sizes, stated in the order in which they come into action are :- 45, 65, 40, 30. The float chamber is of the orthodox type, containing a needle valve which is operated on by the float through the medium of two counter-balance levers. In order to facilitate starting and to effect economy in running, additional air ports are provided immediately above the jets. These are enclosed by a rotable sleeve, controlled from the Manette dial on Steering Column.

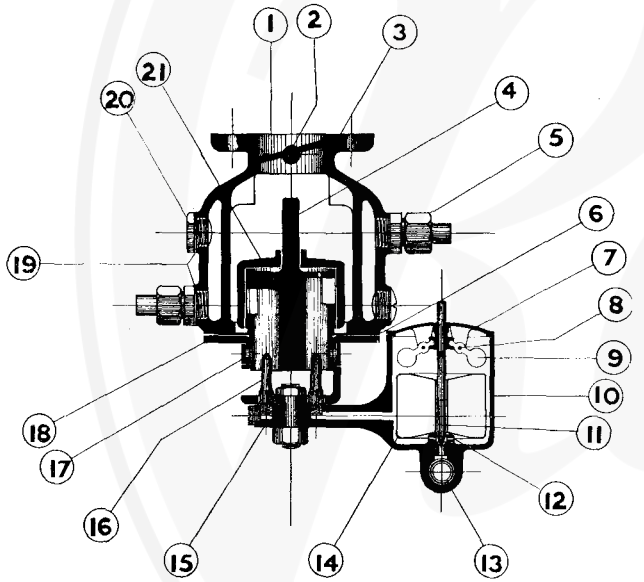


Fig. 10. Description of Carburettor.

1 Throttle Valve.
2 Throttle Valve Spindle.
3 Carburettor Body.
4 Choke Pillar.
5 Water Inlet Union.
6 Paper Joint.
7 Float Chamber Cover.
8 Hinge Pins.
9 Weights.
10 Float Chamber.
11 Needle Valve.
12 Needle Valve Seat.
13 Filter.
14 Float.
15 Jet-Platform.
16 Jets.
17 Air Slide.
18 Body Flange.
19 Fibre Jacket.
20 Jacket Plugs.
21 Automatic Valve.

Petrol is supplied to the Float Chamber Fig. 10 by gravity from a vessel on the Dashboard within which is contained the Autovac Fig. 11 by means of which the fuel is raised from the tank to the gravity vessel. The Autovac consists of a chamber having an outlet valve, an air valve, and a vacuum valve, the two latter being actuated by a float within the vacuum chamber, and the outlet valve is automatic. The vacuum valve is connected by a small bore pipe. The

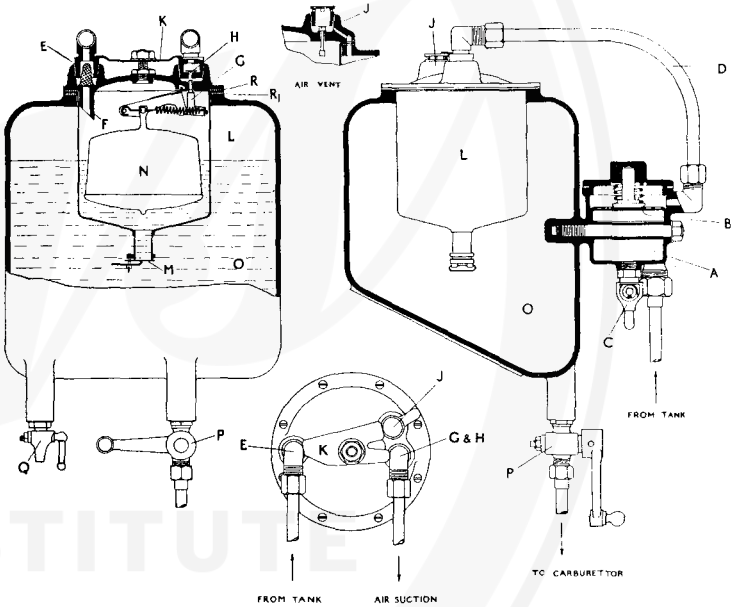


Fig. 11. Description of Autovac.

A. Petrol Filter Body.
B. Petrol Filter Gauze.
C. Petrol Filter Drain Cock.
D. Autovac Supply Pipe.
E. Autovac Petrol Strainer.
F. Autovac Petrol Inlet.
G. Vacuum Valve.
H. Outlet Valve.
J. Air Vent and Valve.
K. Clamp Plate.
L. Vacuum Chamber.
M. Vacuum Chamber Outlet Valve
N. Float.
O. Petrol Container.
P. Petrol Feed Cock.
Q. Petrol Drain Cock.
R. & RI. Cork Joint Gaskets.

function of the float is to close the air valve and open the vacuum valve when it falls and to close the vacuum valve and open the air valve when the chamber is full.

A filter is carried on the exterior of the gravity vessel through which the fuel supply passes before entering the Autovac. The filter is provided with a drain cock, and the filter gauze is accessible and easily removed for cleaning and replacement.

The gravity vessel is provided with a cut-off which is operated from the dashboard shutting off the supply to the carburettor when desired, it is also provided with a drain cock by which in the event of water or other foreign matter passing the filter it may be drained away.

Water Pump and Circulation. The centrifugal water pump Fig. 12 is driven off one end of the cross shaft. The suction on the rotor is balanced by dividing the suction pipe and leading half of the feed water in on each side ; by this arrangement the necessity for a packing gland is eliminated. In order to prevent leakage when standing the rotor is maintained in position against its seat by means of a spring loaded plunger. The pump spindle bearing is lubricated by oil thrown from the crankshaft, the oil supply being regulated by means of a small screw regulator. Delivery from the pump passes direct into the cylinder jacket and thence through the cylinder head to the radiator. Interposed between the cylinder head and radiator is a thermostat which automatically controls a valve, by means of which the water temperature is regulated and the engine attains an efficient temperature a few minutes after starting.

The Radiator is of honeycomb type, and, following established Lanchester practice, is provided with a glass level gauge. Drainage of the water service

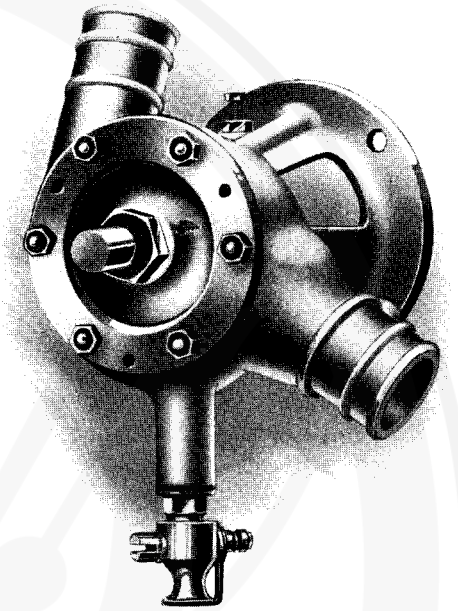


Fig. 12. Water Pump.

is effected by a cock in the underside of the water pump, which entirely empties the water jacket and radiator and also empties the pump rotor chamber. The drain cock handle is readily accessible through a lid in the chassis valance. The total water capacity of the circulation system is 4 gallons.

The Cooling Fan is driven from a grooved pulley on the front end of the crankshaft by a strong reinforced india-rubber belt. The fan is carried on a quadrant and provided with simple means for adjusting the belt tension.

Lubrication is by gear pump driven from a downward extension of the vertical shaft. Oil is forced

under pressure to the main bearings, connecting rod heads and small ends, pistons, camshaft worm drive and bearings. In the base of the oil sump, on the suction side of the pump, is a copper gauze strainer, and on the pressure side of the pump is the oil filter Fig. 4, which is removable without loss of oil or the necessity of emptying the oil sump. In order to maintain a constant oil pressure a spring loaded relief valve is fitted, which allows excess oil to drain back into the sump. The lubrication of the engine is entirely automatic and requires no attention other than the usual periodic re-filling, and removal of stale oil after 5,000 to 10,000 miles running, for which a drain cock is provided in the base of the oil sump, controlled by the same lever that operates the oil overflow level cock. The oil filler Fig. 4 at the front end of the crankcase is provided with a detachable copper gauze strainer. The filler also serves as a crankcase vent.

The Dynamo and Starting Motor. Owing to these being made subject of a separate booklet the reference to them herein is brief and relates only to mechanical features.

The Dynamo Fig. 4, situated at the rear end of the crankcase on the nearside, is driven from the cross shaft through the medium of a Rhinocerous hide coupling of the Oldham type.

The Electric Starter Fig. 4 is mounted on the flywheel casing and lies horizontally parallel to the gear box. The commutator cover is divided so as to make it readily detachable, giving access to the brushes and commutator for cleaning or adjustment. The starter pinion is of the bendix type and automatically engages with a gear ring mounted on the fly-wheel when the armature is set in motion by operating the push-in switch on the instrument board.

The Clutch is of the single disc type, simple in construction and capable of running many thousands of miles without adjustment. The clutch disc is carried on the first motion shaft of the gear box and is in sliding splined connection with same. It is housed within the fly-wheel and when in engagement is gripped between two ferodo discs. The clutch thrust bearing, which is under load only when the clutch is disengaged, is a substantial ball thrust bearing operated by the foot pedal. Mounted on the clutch coupling is a small brake drum; the clutch pedal operates a ferodo faced lever, which when fully depressed makes contact with the clutch brake drum and checks or arrests same. The clutch stop is made adjustable by rotating a wing nut, which is self locking and requires no tools to adjust.

Gear Box. The change speed gear differs from that of our 40 h.p. Car, in that we have adopted a four-speed sliding gear in place of the three-speed epicyclic. The gear wheels are made in nickel chrome case-hardening steel and the teeth are accurately ground to form, after hardening. The change speed gear is simple and easy to operate. The gear ratios are :-

1st speed - -	4 to 1.
2nd speed - -	2.4 to 1.
3rd speed - -	1.6 to 1.
Top (Direct Drive)	1 to 1.
Reverse - -	3.4 to 1.

and it is worthy of remark that when using all forward speeds the reverse pinions are entirely disengaged and are not running. The gear box is provided with an oil filler of approximately 2″ diameter aperture, and an oil level cock is provided situated on the offside of the gear box. Access to filler and oil level cock is obtained by removing the driver's floorboard.

The Transmission is by cardan shaft enclosed within the torque tube. It is connected at the front end to the driven shaft of the gear box by means of a universal joint and connected at the rear end to the worm shaft by a splined joint. A ball bearing supports the propeller shaft in the centre, a housing being provided for same in the torque tube. The "hooks joint" or universal, at the forward end, is automatically lubricated by leakage from the gear box, which also provides lubrication for the torque tube ball and for the propeller shaft centre bearing.

The Rear Axle Fig. 13 is substantially a replica of the 40 h.p. on a reduced scale, consisting of three principal components, the centre gear box containing the worm gear (which is of the well-known Lanchester silent high efficiency type) and differential, and the two sides consisting of axle casings carrying the spring brackets and brake brackets, etc. The standard ratio of Worm Gear is 7-34, i.e., 4.86 : 1.

The worm gear box is divided horizontally, the top being easily removable for inspection without disturbing the worm gear or differential bearings.

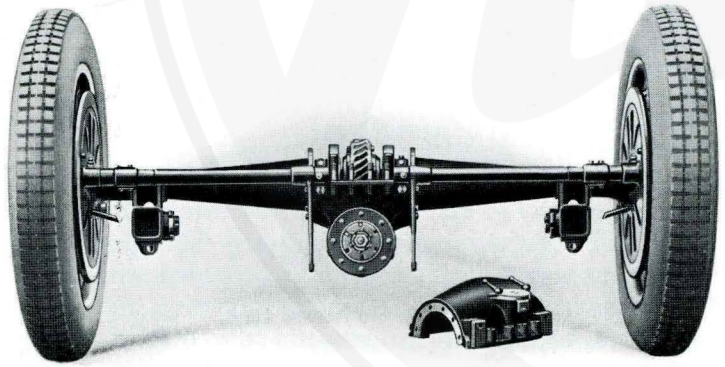


Fig. 13. Rear Axle.

The axles are of the three-quarter floating type and are connected to the wheel hubs by combined splines and cones, the conical portions being drawn up tight into the hubs by means of a nut.

The hubs are mounted on the ends of the axle casing on robust ball bearings, approximtaely in line with the wheel track.

The rear axle casing is connected to the chassis by a torque tube which is permanently bolted to the worm gear box at the rear end and articulated to the rear end of the power unit with a large spherical joint.

The Front Axle Fig. 14 is of tubular construction to resist the torsional loads imposed by the action of front wheel brakes. The axle carries the under-slung semi-elliptic springs and the brake operating shaft. The stub axles are drop forged, and incorporated with them are the upper and lower journal bearings of the swivel head. The ends of the steering lever and steering coupling levers are of taper formation, the tapers fitting into sockets of similar formation in the swivel heads into which they are also keyed and secured by castle nuts.

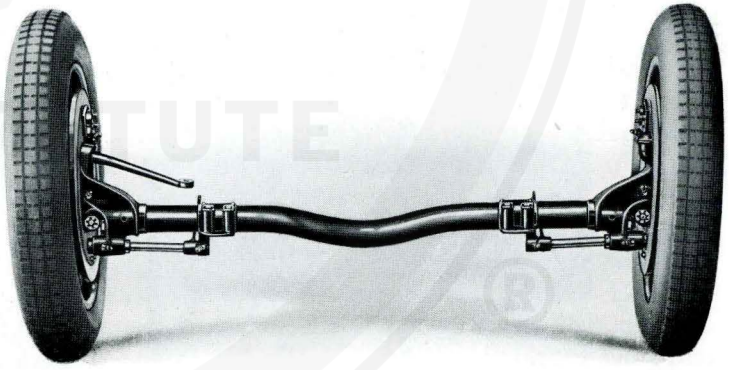


Fig. 14. Front Axle.

The Steering Gear is similar to that of our 40 h.p. Car. The column is secured to the chassis frame at the lower end by means of a pivot bolt. Passing through the foot board it is supported at the dashboard by a bracket. In order to vary the rake of

Fig. 15. Steering Shaft.

the steering column to suit different types of bodies and different drivers' requirements, three marks of dash-board brackets are manufactured, normal, high, and low,

The steering shaft consists of a steel tube, on the lower end of which are cut right and left-hand threads, engaging with two half sleeves Fig. 15, one of which has internally a portion of thread right-hand and the other left-hand, corresponding with the threads on the shaft. The lower ends of the sleeves terminate in hard steel blocks which bear on two hard steel rollers mounted in sockets provided in the rocking shaft. The trunnions of the rocking shaft are carried on

bearings formed in the base of the steering box; one end of the shaft protrudes from the steering box and carries the steering lever, which is connected by means of combined spline and cone joint. At the head of the steering box Fig. 16 a ball thrust bearing is provided, which is adjustable externally. The tubular steering shaft is enclosed within the steering column and is supported at the top close up to the steering wheel by means of an oil-less bearing. The steering wheel Fig. 17 is of large diameter and carries the control levers for ignition, carburettor and air, mounted in the centre. The manette tubes pass through the steering column; the outside one being clamped to the steering base

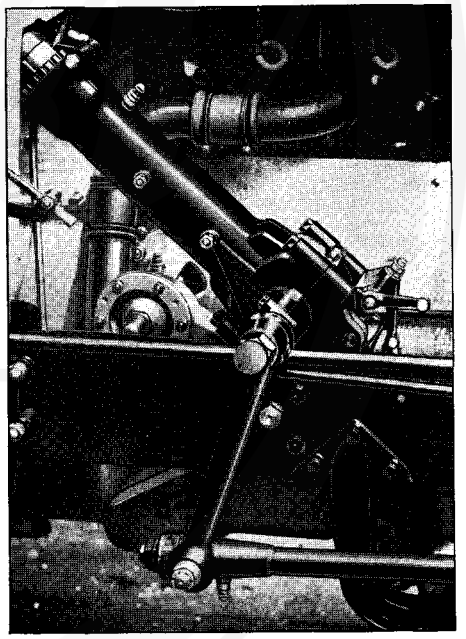


Fig. 16. Steering-Box.

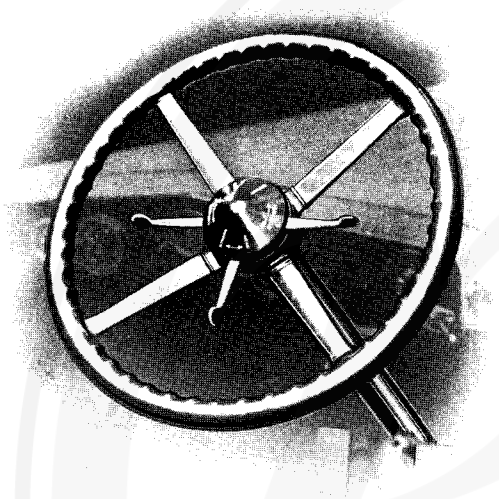


Fig. 17. Steering Wheel.

carries the manette dial; to the inner tubes, at their upper end, are attached the controls for throttle, ignition and carburetter; and at the lower end is the throttle lever, ignition lever and carburettor control mechanism. The levers and the links connecting them have quick detachment joints of special ball and socket design Fig. 18.

The Brakes are of internal expanding type acting on all four wheels. The brake drums are aluminium of large diameter with cast iron liners. The brake shoes are faced with ferodo and are retained in position by tension springs. The brake pedal simultaneously applies the front and rear wheel brakes; the hand brake lever operates the rear wheel brakes only, by independent linkwork. Below the pedal shaft is a compensating bell-crank from which actuating links are

Fig. 18. Manette Levers Ball Ends.

carried forward to a lever on the front brake shaft and rearward to the rear wheel brake shaft. The front brake shaft is mounted forward of the axle in order to harmonise the brake link motion with that of the front axle. ~~The operating link terminates at the front end with a simple and accessible adjustment~~. At the ends of the cross-shaft are levers which are linked to the brake camshafts, supported in bearings beneath the axle. The brake camshaft terminates with an eye, in which is mounted a rotable cam, so that whilst rotation of the shaft forces the brake shoes apart in the usual manner, the action of the cams is undisturbed by steering movements.

The main operating link of the rear wheel brakes is carried backward from the compensator bell-crank to a lever mounted at the end of a cross-shaft,

carried in brackets secured to one of the torsional members of the chassis frame. This cross-shaft carries two levers connected by links to levers on the actuation shafts, situated on the rear axle casing, which actuate the brake shoe cams. Separate actuation is provided for the hand brake which operates independently on the rear wheel brakes only.

Suspension. The Rear Suspension Fig. 20 is of the Lanchester Cantilever design. A range of 4 types of springs are standardised to suit different weights of bodywork, and provision is made for approximately $1\frac{3}{4}$" of adjustment vertically. The springs are pivotted at their centre on bearings having a floating phosphor bronze bush. Oil is employed as a lubricant and the pin on which the bearing is mounted is of large diameter and hollow, forming an oil reservoir. In place of

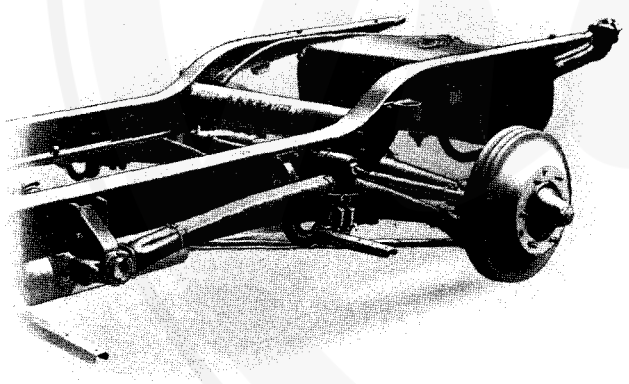
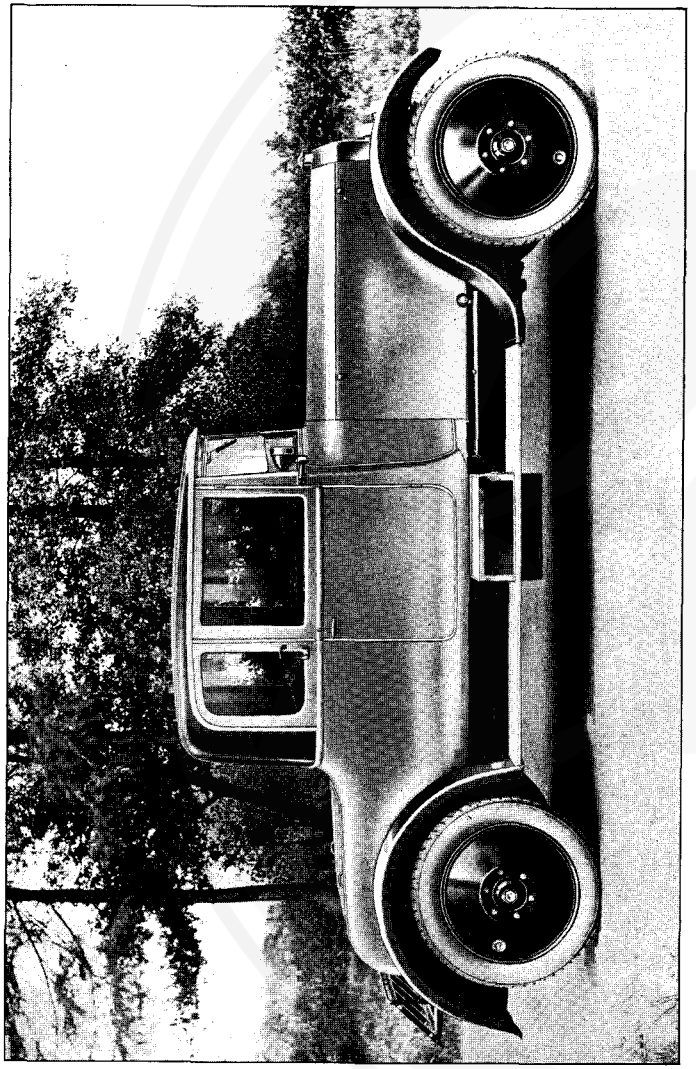


Fig. 20. Rear Suspension.

the usual spring shackles the ends of the springs are carried in phosphor bronze trunnions provided with a rectangular aperture passing diametrically through them for the reception of the spring extremities which are closely guided, and an adjustment is provided to take play due to wear. The spring leaves themselves are highly polished and are interleaved with hard rolled brass perforated inserts. These are loaded with lubricant and the whole spring encased in a leather gaiter. The trunnions are located in the suspension brackets, which are provided with ball valve lubricators.

The Front Suspension. Whilst closely following orthodox design, possesses some marked differences. The deflection is about 50 per cent greater than is usually provided and the springs are more robust than those of any other chassis marketed to-day. The springs are anchored at their front end to the dumb iron with hardened steel bolts passing through the eyes of the master leaf, the bearing being a phosphor bronze floating bush. The shackle at the rear end is also of hardened steel and floating phosphor bronze bushes are employed. Following the construction of the rear springs, the leaves are polished and are built up alternately with perforated brass inserts loaded with lubricant, the springs then being encased in leather gaiters. Oil is the lubricant for the spring joints, the joint pins and shackle pins being provided with ball valve oil chambers. Two marks of front springs are standardised, to suit variations in load due to type of body and equipment.



21-h.p. 6-Cylinder Lanchester Fixed Head Coupe.

Starting and Running Instructions.

The following is intended to give the purchaser a knowledge of the use and position of the mechanism referred to in the instructions.

The ignition switch is on the instrument board immediately in front of the steering column.

The ignition timing is, as usual, controlled by a manette lever mounted on the steering column, the direction of advance being indicated by an arrow on the manette dial. The controls for throttle and air are also mounted on the steering column.

The carburettor is arranged on the offside of the engine, and is fed by means of the Autovac System described on page 21. Vacuum feed is to-day accepted as being the most reliable and is a system that rarely requires attention of any kind.

The Electric Starter is operated by a push-in switch situated on the instrument board to the right of the ignition switch. The Starter pinion is of the bendix type and automatically engages with a gear ring mounted on the engine flywheel.

The Starting accumulators are housed in a box on the off-side step board.

The charging Dynamo, situated at the rear of the crankcase on the nearside, is controlled by the charging switch "D" on the instrument board.

In cold weather it is much kinder to the accumulators when first starting up to hand crank the engine over slowly two or three times, in order to disturb the oil film, which may have become congealed.

INSTRUCTIONS.

Before Starting. See that the radiator is filled with water nearly to the top of the glass level gauge.

See that the engine crankcase is filled with oil to the requisite level. (See Lubricating Instructions.)

See that there is sufficient petrol in tank.

See that the petrol tap situated on the instrument board is turned on.

Advance ignition lever about half-way.

See that the air control lever is at "strong" position.

Turn ignition switch to "on" position and press in the starter switch firmly and decisively, releasing pressure immediately the engine is started.

After a few minutes running the position of the air control lever may be altered from "strong" towards "weak" as far as possible consistent with obtaining good "pulling."

In warm weather the engine will be started without flushing the carburettor, but where the Motor house is insufficiently heated it may be found necessary in cold weather to flush the jets in the usual manner by lifting the Float Needle. Priming taps are fitted in the Induction pipe as an additional aid, to facilitate starting in exceptionally cold weather.

DRIVING.

The engine speed, and consequently car speed, is controlled alternatively by the throttle manette lever on the steering wheel or by the accelerator which is placed to the right of the brake pedal. The usual and most convenient method of speed control is to place the throttle lever in the best position for slow running and increase speed by the use of the accelerator. The average position of the ignition manette lever is approximately half-way up the rack. It should only be retarded for dead slow running, or advanced beyond this point for high speed running. In cold weather, or before the engine has got warmed up, it may be found advantageous to advance the ignition.

When starting from cold, before switching on the ignition, it is advisable to open the throttle fully and give the engine about half a dozen turns with the starter, then close the throttle and switch on. This generally speaking, facilitates starting and obviates the necessity of flushing the carburettor, even in cold weather. Immediately after starting it is frequently advisable to keep the induction flow agitated by sharply patting the accelerator pedal with the foot.

Maintenance.

FOREWORD.

A Car, like every other mechanical device, requires a certain amount of care and periodical attention, in order to obtain the best service. In the Lanchester "Twenty One," facilities have been provided, to enable the owner himself to make minor adjustments incidental to ordinary usage and to render the ordinary maintenance of the Car as simple as possible. The replenishment of the water and oil supplies are ordinary operations which every owner realises must be executed, but it is to be feared that too few regard the running adjustments in the same light, and in consequence because the Car, although not quite up to its usual form, is running well enough, adjustments are neglected. It is not suggested that the owner-driver should undertake, or be able to undertake, such work as the adjustment of big end bearings, but there are several running adjustments, which, although important are very easily carried out by the man who may have but little mechanical knowledge, and in the following pages are instructions for such adjustments as are in no instance beyond the skill of the owner-driver.

Lubrication.

THE qualities demanded by the Owner Driver are of equal benefit to the professional Chauffeur and in Lanchester Cars a special study is made of the requirements of both. The position of Oil Fillers and Filters, Oil Drains and Lubricators, has been studied with a view to their accessibility and to reduce to a minimum the number of lubrication points.

The Engine Oil Sump holds $1\frac{3}{4}$ gallons of oil, sufficient to run about 750 miles. The Oil Filler "A" Figs. 21 & 23 is located in an accessible position on the nearside front engine bracket. An Oil Level Cock "B" Fig. 22, is provided on the offside of crankcase, which, when the handle "C" is in its central position is shut off, moved forward it gives the oil overflow level, and backward opens the sump oil drain "D." The engine oil sump should be filled to the level of the overflow cock. In the base of the oil sump is a fine mesh copper gauze strainer, which is on the suction side of the pump, and on the pressure side of the pump is an oil filter "E" Figs 21 & 23 which is so designed as to be removable without loss of oil or the necessity of emptying the oil sump. In event of overfilling, allow the oil level cock to remain open until the oil ceases to flow. In order to keep the driver informed as to the automatic lubrication of the engine, an Oil Pressure Gauge is provided on the instrument board. As long as the oil gauge operates there is no need to refill with oil; the first indication that the engine requires refilling will be that the pressure gauge ceases to act when travelling downhill and recovers when travelling on the level or uphill.

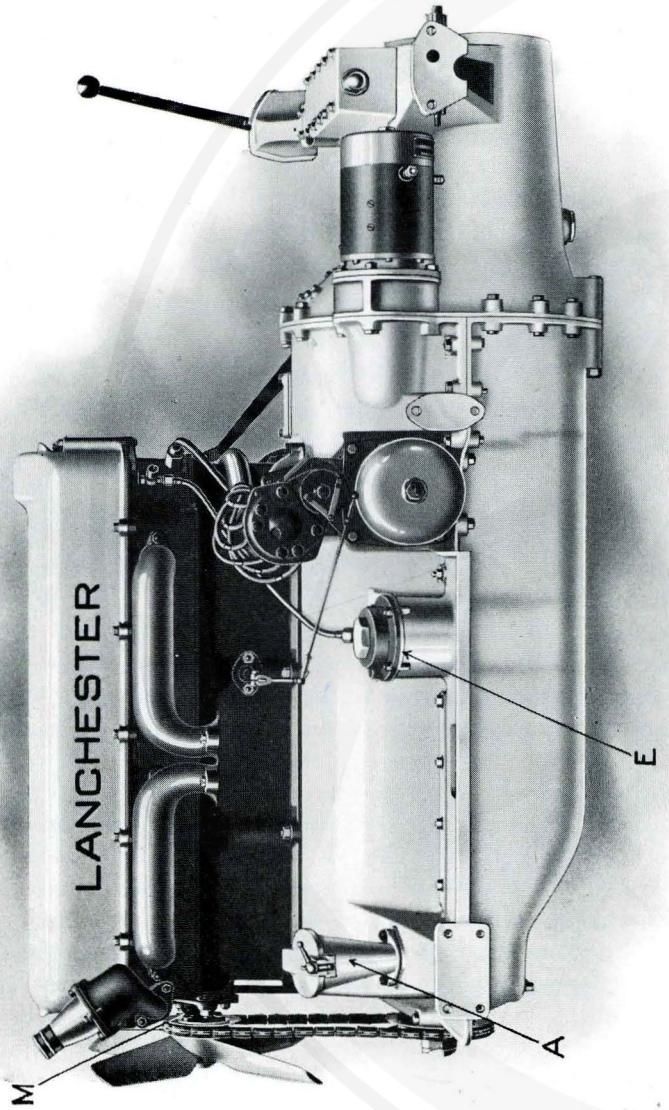


Fig. 21.

The Gear Box contains 1 gallon of oil. The filler "F" Figs. 22, 24 & 25 is situate in the centre of the gear box inspection cover. Access is obtained by removing the driver's floorboard. Adjacent to the filler on the offside is an Oil Level Cock "G" and handle for same "H" Figs. 22 & 24 which should be opened when filling the gear box. When oil commences to flow from the level cock, cease filling, close the level cock and screw down the filler lid. The gear box should be refilled after about 1000 miles.

For both Engine and Gear Box use Lanchester "A" Cylinder Oil.

The Rear Axle Worm Gear Box contains $\frac{1}{2}$-gallon of oil, sufficient to run about 800 miles. The worm gear box is provided with a filler "J" Fig. 24, which is accessible by removing the rear seat cushion and seat board. An Oil Level Cock "K" is provided on the side of the worm gear box approximately opposite to the filler. When filling, the level cock should be opened and when oil commences to flow from the level cock cease filling, close the level cock and screw down the filler lid.

The Oil employed for the Rear Axle is Lanchester "B" Oil.

Leakage from the Rear Axle Casing automatically lubricates the Rear Hub Bearings. The Propeller Shaft Central Bearing is lubricated automatically from the Gear Box.

It will be observed that the Oil Fillers of Engine, Gear Box and Rear Axle, are of unusually liberal proportions, thus rendering the operation of filling exceptionally clean and easy. Furthermore, the oil filler lids are opened without the aid of tools.

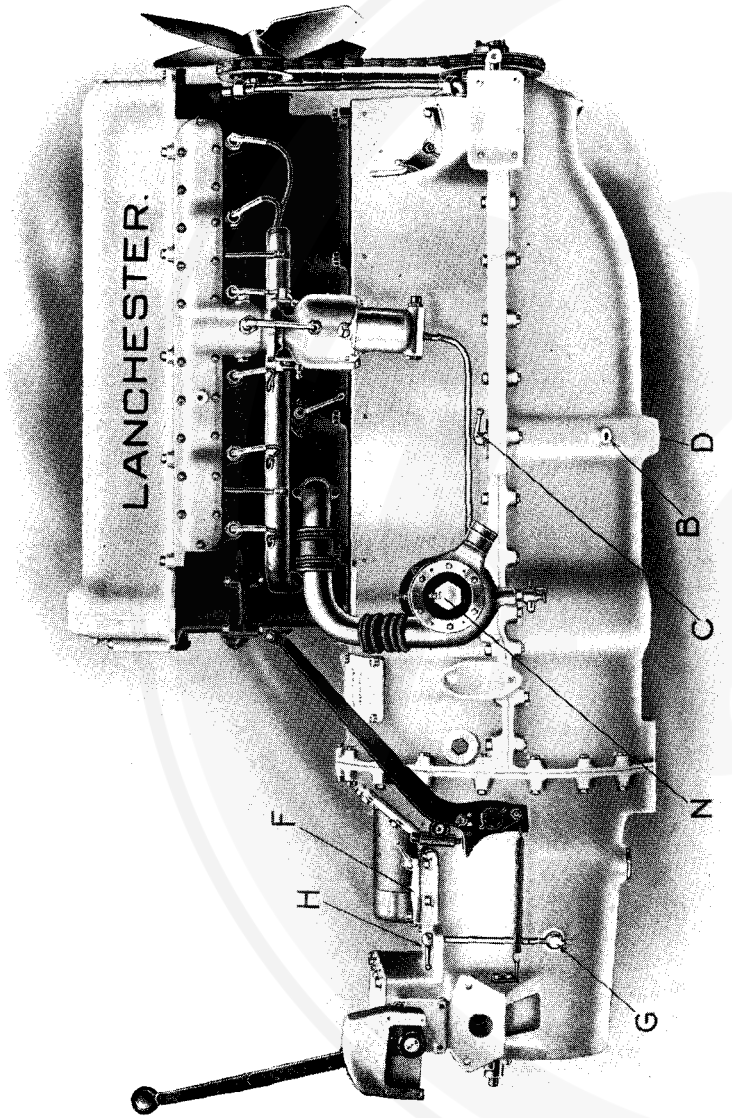


Fig. 22.

Parts requiring hand lubrication periodically are :-

Rear Spring Centre Pin Figs. 23 & 24.
Rear Spring front and rear Trunnions. Figs. 23 & 24.
Steering Link Joints. Fig. 24.
Steering Coupling Link, both ends.
Steering Pivot Pins.
Front Wheel Brake Shaft.
Front Wheel Brake Swivel Cams.
Front Spring Dumb Iron Pins. Figs. 23 & 24.
Front Spring Shackle Pins. Figs. 23 & 24.
Manette Control Shaft (at foot of Steering Column.)
Steering Column Base. Fig. 24.
Hand Brake Actuating Shaft.
Rear Foot Brake Actuating Shaft.
Brake Shafts on Rear Axle.

All the above parts are lubricated by means of the "Enots" flexible nozzle oil gun and the lubricant used is Lanchester "B" Oil.

The Brake and Accelerator Pedals are provided with oil-less bearings and do not require lubrication.

The parts in the following list should be periodically hand oiled, using the Lanchester Syringe Loco Oiler and Lanchester "A" Oil :-

Rear Brake Link Knuckles. Fig. 24.
Hand Brake Link Knuckles.
Brake Compensator Lever Knuckles. Fig. 25.
Brake Compensator Location Plunger.
Front Wheel Brake Link Knuckles. Fig. 24.
Front Wheel Brake Actuation Link, Coupling Shaft and Knuckles.
Starting Handle Guide.
Change Speed Selector Shaft Bearing. Figs. 23 & 25.
Hand Brake Lever Shaft.

The Dynamo and Starter require very little lubrication ; a small quantity of thin grease should be applied to the commutator end bearing, accessible by removing the hexagon nut which keeps the commutator end cover in place. Over lubrication will cause sparking of brushes and should be avoided.

The magneto is lubricated through two small oil wells provided at the distributor end and one oil well at the driving spindle end. It is of the utmost importance that only a very small quantity of thin oil should be applied to these parts (six drops in each well is sufficient) and no oil should be used on any other part of the machine.

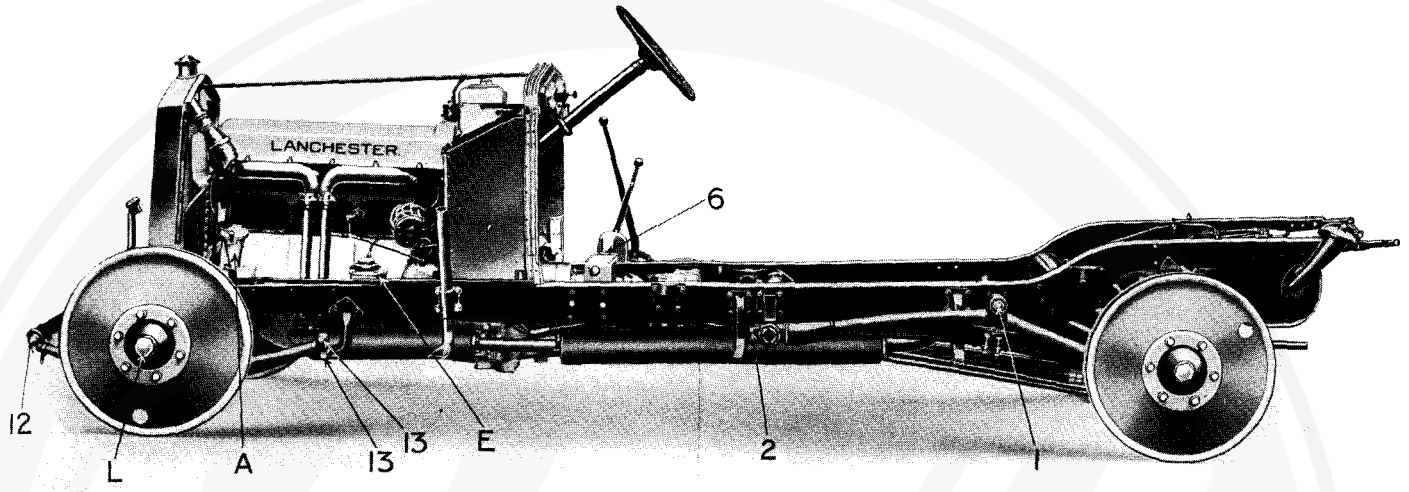


Fig. 23.

A.
E.
L.
1.
2.

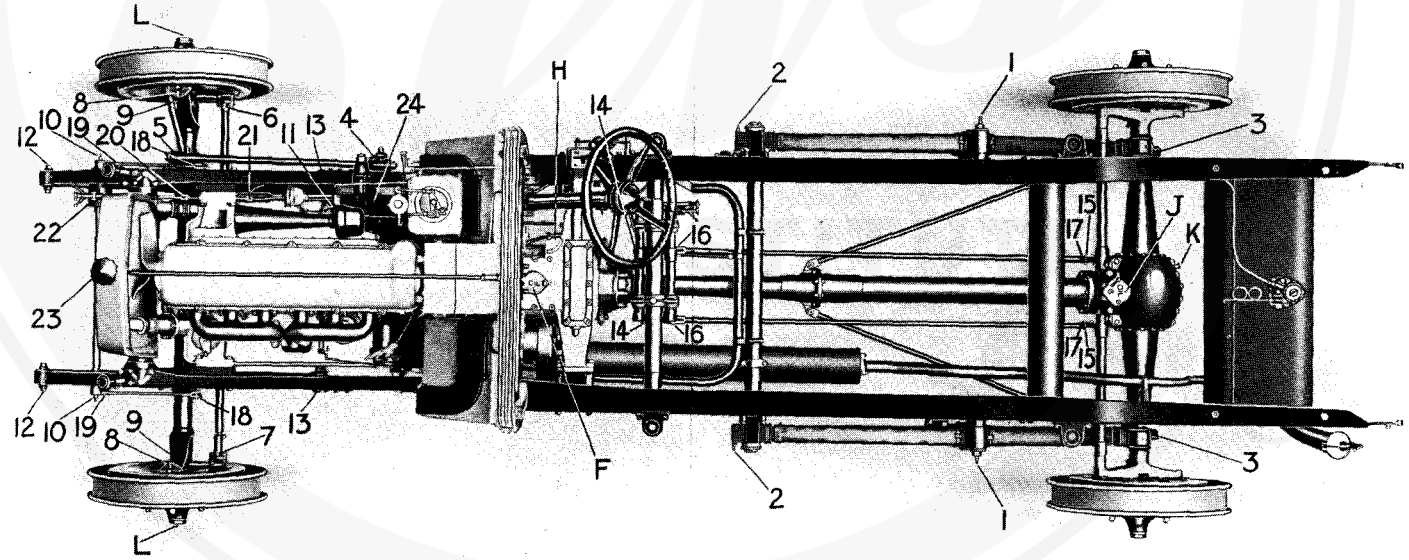


Fig. 24.

F.
H.
J.
K.
L.
1.
2.
3.
4 &
6 &
8 &
10.

DESCRIPTION OF FIG. 23.

A. Oil Filler.
E. Oil Filter.
L. Front Hubs.
1. Rear Spring Centre Pin.
2. Rear Spring Front Trunnion.
6. Change Speed Selector Shaft Bearing.
12. Front Spring Dumb Iron Pin.
13. Front Spring Shackle Pins.

In order to obviate lifting the floorboards to lubricate the Rear Brake Actuating Shaft Bearings, oil pipes are provided leading through the chassis frame on the near side where lubrication nipples are mounted. As indicated by an engraved plate, two of these lead to the Rear Foot Brake Shaft and two to the Hand Brake Shaft.

DESCRIPTION OF FIG. 24.

F. Gear Box Oil Filler.
H. Gear Box Oil Level Cock Handle.
J. Rear Axle Worm Gear Box Oil Filler.
K. Rear Axle Worm Gear Box Oil Level Cock.
L. Front Hubs.
1. Rear Spring Centre Pin.
2. Rear Spring Front Trunnion.
3. Rear Spring Rear Trunnion.
4 & 5. Steering Link Joints.
6 & 7. Steering Coupling Link.
8 & 9. Steering Pivot Pins.
10. Front Wheel Brake Shaft.
11. Manette Control Shaft.
12. Front Spring Dumb Iron Pins.
13. Front Spring Shackle Pins.
14 & 15. Rear Brake Link Knuckles.
16 & 17. Hand Brake Link Knuckles.
18 & 19. Front Wheel Brake Link Knuckles.
20 & 21. Front Wheel Brake Actuation Link, Coupling Shaft and Knuckles.
23. Starting Handle Guide.
24. Steering Column Base.

The following parts require periodic lubrication with grease :-

Front Hubs. Figs. 23 & 24.
Radiator Fan Hub. M. Fig. 21.

For the lubrication of these parts use the Lanchester Grease Gun provided in the Kit. A special adaptor for the Front Hubs is included.

N.B. In cold weather it is advisable to warm the Front Hubs by means of a Painters Blow Lamp or Gas Jet, in order to make the grease flow readily. It is sufficient to warm the Hub to a temperature comfortable to the hand.

In lieu of Lanchester Oils specified, other, proprietary brands equivalent may be used, such as :-

For Engine and Gear Box.	*For Rear Axle.*
Shell Mex Super "L."	Shell Mex Super "H."
Wakefields Castrol "X.L."	Wakefields Castrol "S."
Prices Motorine "C."	Prices Amber Gear Oil.
Vacuum Mobiloil "A."	Vacuum Mobiloil "B."

When lubricating Spring Centre Pins, Trunnions, or Shackles the chassis should be jacked up so that the axles are suspended on the springs and the wheels clear of the ground. By this means the lubricant is allowed to flow between the surfaces normally under pressure. The foregoing also applies to the lubricating of the steering pivots and steering links.

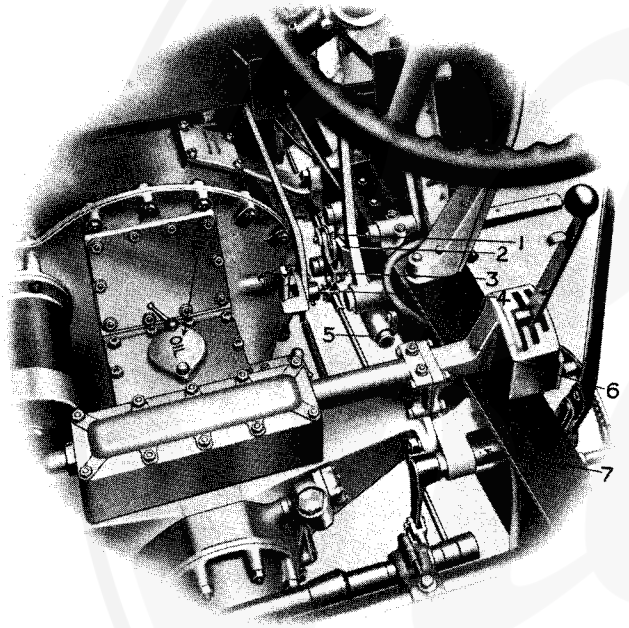


Fig. 25.

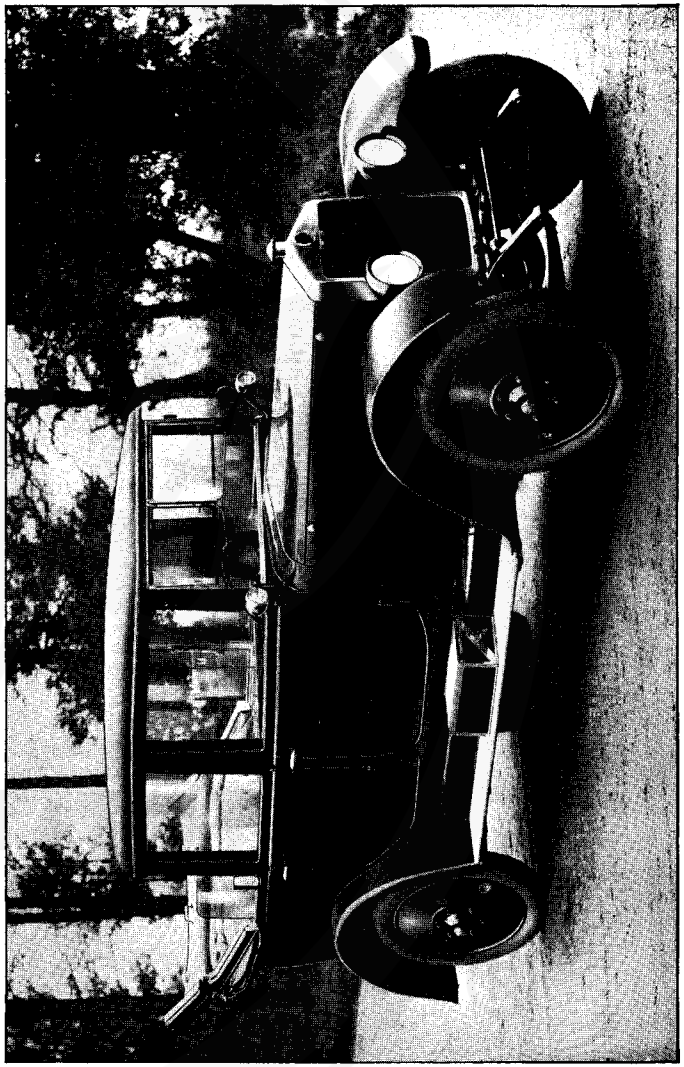
F. Gear Box Filler.

1. 2. 3. & 4. Brake Compensator Lever Knuckles.

5. Brake Compensator Location Plunger.

6. Change Speed Selector Shaft Bearing.

7. Hand Brake Lever Shaft.



21 h.p. 6-Cylinder Lanchester 6-Seat Enclosed Drive Three-quarters Landaulet.

ELECTRICAL PLANT.

Instructions concerning the Electric Starter and Generator are contained in a separate book issued by the manufacturers Messrs. J. Lucas Ltd., and included in the car equipment.

BATTERY MAINTENANCE.

General instructions including those for first charge of Accumulators.

Acid. This should be pure Brimstone (Sulphuric). Specific Gravity 1·225.

The Electrolyte (another term for dilute acid) is a mixture of Pure (not Commercial) Sulphuric Acid and Distilled Water. The density in the cells should be 1·225 and is in the proportion of about one part of acid to four parts of water, by volume.

The specific gravity of the acid will be affected to some extent by the temperature and may vary 10 to 20 points above or below the normal.

When cells are sent out dry and uncharged and the dilution of acid has to be carried out on site, care must be taken to pour the water into the mixing vessel *first*, adding the acid by degrees and stirring constantly.

To mix the acid either a lead, lead-lined wood or a glazed earthenware tank should be employed.

On no account must metal vessels be used.

The Acid must not be used until it is quite cold.

The first charge must be continuous.

Charging must commence immediately after adding acid to the cells, otherwise damage will result.

The rate should be 4 amperes and should be continued until gas is freely evolved from all the plates and the voltage has remained constant at 2·55 to 2·6 volts for at least three hours.

This generally requires about 48 hours.

After the preliminary first charge has been completed and the battery has been put into regular working condition, the following procedure should be adopted for charging, etc. The charge should be continued until gas bubbles are being given off from both positive and negative plates.

As a general rule about 11 per cent. more in ampere hours or about 34 per cent. in watt hours (an ampere hour efficiency of about 90 per cent. equals a watt hour efficiency of about 75 per cent.) should be put into a battery than has been taken out since the previous charge, this excess of charge over discharge causing the above mentioned gassing to take place.

Insufficient Charge. Positive plates which are insufficiently charged become, first, a brick-red colour and next a patchy light red, or even in certain cases, a grey colour. (Don't be misled by the loose lead sulphate which settles on the top of the plates.) Under such conditions electrical action taking place between the component parts of the plates themselves, may cause buckling and will in any case, tend to rot the plates and shorten their useful life.

Cells must never be run down below 1·8 volts per cell, nor must they be left in a discharged or partially discharged state, but always be recharged as soon as possible after a discharge is completed.

Overcharge. Positive plates which are systematically overcharged become almost black and the active material is dislodged, causing heavy deposit and growth on negatives. Excessive charging must be avoided as it destroys the plates and causes the active material to be thrown out and deposited on the bottom, when eventually it will cause a short circuit between the positive and negative plates.

MAINTENANCE OF IGNITION.

Sparking Plugs. The importance of keeping the spark gap correctly adjusted is too frequently overlooked. The gap should be adjusted to not less than .016″ wide and not more than ·020″. The valve clearance slip gauges together total ·015″ and may be used as a minimum gauge for the spark gap, while the magneto contact breaker slip gauge is approximately ·020″ and may be used as a maximum gauge. Neglect of this precaution may result in the breakdown of the magneto high tension circuit, either by causing the high tension slip ring brush and insulation to become burnt, or by breaking down the armature winding, due to the resistance caused by a wide gap ; whilst too narrow a gap will cause missing fire.

Magneto. The adjustment of the contact breaker and cleaning of the high tension distributor are simple and familiar to almost every driver and consequently no directions are considered necessary.

In addition to the attention that these parts require the high tension slip ring brush should periodically be removed and cleaned. See that the carbon contact is clean and free from oil and that the brush works freely in its holder; clean the slip ring with a small paint brush or piece of cotton fabric attached to a wooden stem.

The high tension slip ring brush is situated behind the horseshoe magnets at the driving spindle end of the magneto. In order to remove it, remove the back cover which is held to the base casting by two cheese-headed set pins—the slip ring brush holder will then be visible and is detached by removal of two cheese-headed screws which secure it to the base casting.

Running Adjustments.

ADJUSTMENT OF FOUR WHEEL-BRAKES.

In the majority of internal expanding brakes as fitted to the road wheels of automobiles the wear of the brake drums and shoe linings is adjusted by rotating the cam which expands the brake shoes. This procedure alters the leverage of the cams and when the adjustment is approaching its limit the cams are liable to assume an angle at which the spring returns them to zero with difficulty, and sometimes fails to return them, leaving the brake shoes rubbing the drums.

In the Lanchester four-wheel brakes this difficulty has been overcome by arranging the cams so that their axis invariably returns to a direction radial to to the centre of the brake drum, and the adjustment is made by moving the pivots of the brake shoes relatively to one another. The brake shoes are carried on separate pivots mounted within a rotable disc (A - Fig. 1); the disc is held in position by set pins which enter one pair of a series of vernier adjustment holes (marked 1st. 2nd. 3rd. &c. in Figs. 2, 3 and 4.)

Owing to the fact that there is no compensator between the near and offside brakes, either front or rear, the brake shoes and linings invariably tend to wear an equal amount. Therefore, when an adjustment becomes necessary, both sides are set up an equal amount.

The rotable disc is provided with six stages of adjustment. To adjust, observe by the diagram which is the next stage of adjustment to that in which the set pin is already placed, remove the set pin, rotate the disc by means of the special spanner until the next pair of vernier holes come into line, replace the set pin and tighten securely. Repeat the same procedure with the

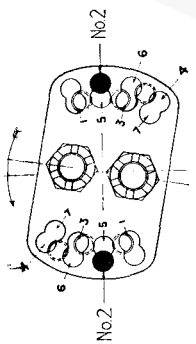


Fig. 2

Left Hand, Near Side Front, and Right Hand, Off Side Rear.

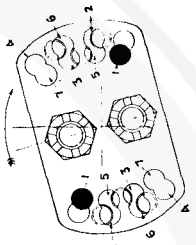


Fig. 3

Right Hand, Off Side Front, and Left Hand, Near Side Rear.

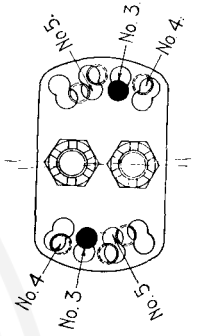


Fig 4

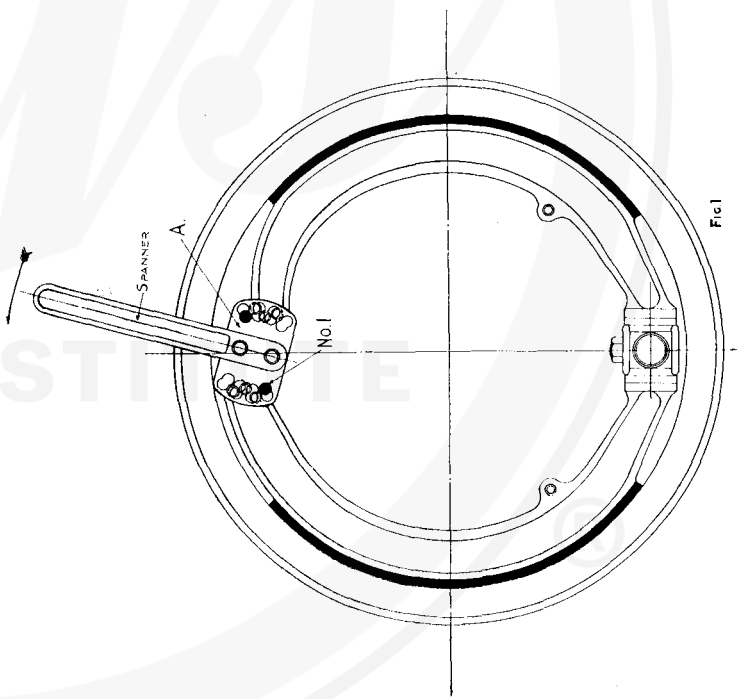


Fig 1

N.B.— To adjust Off Side Front and Near Side Rear turn spanner clockwise.
To adjust Near Side Front and Off Side Rear turn spanner contra- clockwise

corresponding front or rear brake. The brakes being right and left hand, the direction of motion of the disc will be clockwise on the one side and contra-clockwise on the other. Figs. 2 and 3.

It should be pointed out that the initial setting of the brake is not necessarily the position marked No. 1 on the diagram. The process of testing, and errors due to manufacturing, may necessitate the initial adjustment being in another position, but the adjustment will always proceed in the direction indicated by the diagram, i.e., position 3 will follow position 2 and so forth.

The vernier adjustments are so divided that the brake cannot be set up two stages without fouling; it is therefore necessary to be careful only to adjust one stage at a time.

VALVE ADJUSTMENT.

The tappet levers are mounted on a pedestal (A - Fig. 27) having an eccentric pin (B) which forms the bearing of the levers, the eccentric being arranged so that partial rotation of the pin lifts or lowers the lever fulcrum ; rotation in the one direction raises the fulcrum and (regarding the end in contact with the valve as invariable) reduces the clearance between the cam roller and the cam; rotation in the opposite direction correspondingly increases the clearance between the cam roller and the cam. The correct clearance between the valve stem and tappet levers is ·005″ to ·006″ on the exhaust valves and ·004″ to ·005″ on the feed valves. A slip gauge is provided in the car's tool equipment for measuring this clearance, but in lieu of the slip gauge, a piece of 38 S.W.G. sheet metal is suitable for checking the exhaust valves and a piece of 40 or 41 S.W.G. metal for the feed valves.

REMOVAL OF CYLINDER HEAD.

Valve Cover. Remove the ⅜″ nuts (14 in all) by which the cover is secured, also remove the washers beneath the nuts.

The oil joint between the cover and the clyinder head is made with "Hermetite" varnish, and it will probably be found necessary to give the cover a smart blow with a mallet or hammer stave as near as possible to each end, to dislodge the joint. Then by means of the finger grips at the front and rear ends of the cover, lift it off. Before replacing it, scrape the joint face on the cylinder head and on the cover and make same thoroughly clean, then re-dress thinly with "Hermetite."

To remove the Cylinder Head. Drain water out of cylinders and radiator; disconnect electric cable

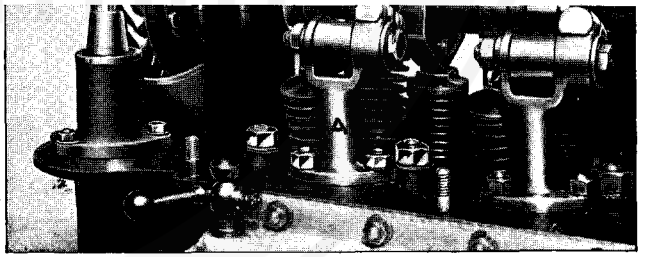


Fig. 27.

the induction pipe and slack out or remove same from autovac. Disconnect manette links from throttle and air sleeve. Disconnect water outlet pipe union from the back of the carburettor jacket. Turn off petrol from autovac. Disconnect petrol pipe union from the float chamber and remove the carburettor from the induction pipe.

Exhaust Downtake Pipes. Disconnect the exhaust downtake pipes from the header pipe (as seen in Fig. 21 page 40).

Thermostat. Remove hosepipe joint between the radiator and thermostat, and remove the thermostat where secured to the cylinder head. (There is no necessity to break the middle joint of the thermostat). Disconnect oil supply union and oil drain pipe unions from the cylinder head (see No. 31, Fig. 3 page 10, and Nos. 12 & 13, Fig. 4, page 12). The oil drain pipes are fitted at both front and rear of cylinder

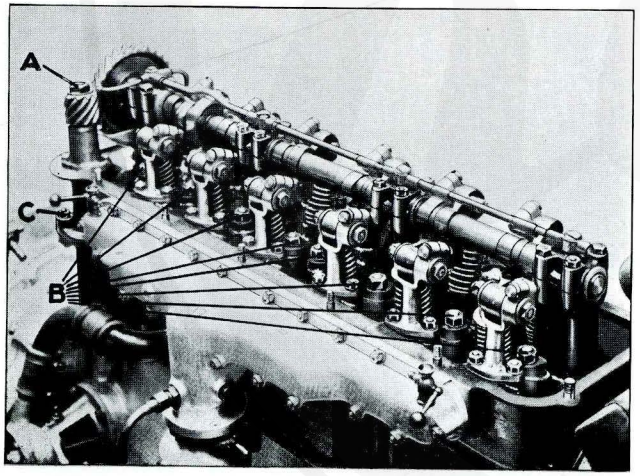


Fig. 28.

head. Remove the nut on the top stud of the fan bracket which secures the latter to the cylinder head.

Cylinder Head. Remove the nut (A - Fig. 28) from the top of vertical shaft and withdraw the spiral pinion from the vertical shaft; remove $\frac{7}{16}$" nuts (B) and washers (16 in all) with box spanner supplied in kit; remove three $\frac{3}{8}$" bolts (C) securing the vertical shaft housing to the cylinder. Use slight leverage to dislodge the cylinder head from the dowel bolts, prising off the fan bracket stud at the front end (Fig. 29) and under the cam gear tray at the rear end prise off a packing block placed on the crankcase (Fig. 30). The cylinder head can then be lifted off.

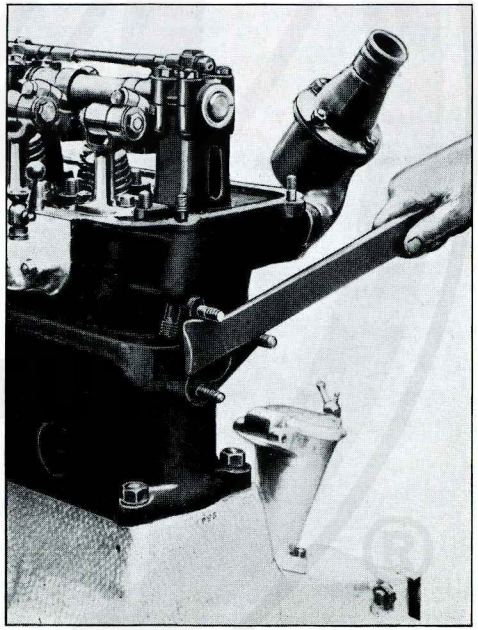


Fig. 29.

Note :- 1. Lift off true and square ; at the same time rotate the engine shaft slowly to ease withdrawal from the vertical shaft bearing.

2. Do not damage gasket by inserting a sharp tool in the joint to dislodge the head.

3. Wipe gasket clean and replace it dry.

4. Replace $\frac{3}{8}$" washers and nuts and tighten up evenly, commencing at the centre four and working outwards towards the ends.

5. Replace the three $\frac{3}{8}$" bolts round vertical shaft housing.

6. Repeat the operation of tightening nuts, and repeat it yet again when the engine is warm.

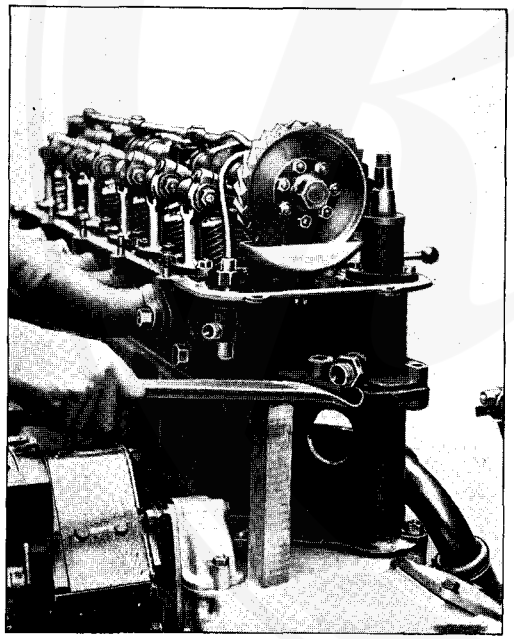


Fig. 30.

REASSEMBLING THE CYLINDER HEAD.

Having replaced the valves and valve tappets, and replaced the cylinder head on the cylinders ; in order to replace the vertical shaft screw pinion in the position which brings the valve timing correct, rotate the engine crankshaft forward until the mark on the flywheel "No. 1 and 6 Feed Opens" is opposite the centre of the valve timing inspection hole. See that the magneto distributor is in position to fire No. 1 cylinder. (Position of distributor brush holder should be opposite the small circular inspection hole in the distributor cover and displays the No. 1). Set No. 6 inlet and exhaust valves to the correct clearances, as mentioned on page 54. Standing on the feed side of the engine, pull the camshaft gear wheel over towards you until No. 6 inlet valve commences to open, and mark the outside edge of the thrust flange (A - Fig. 31) and the rear bearing

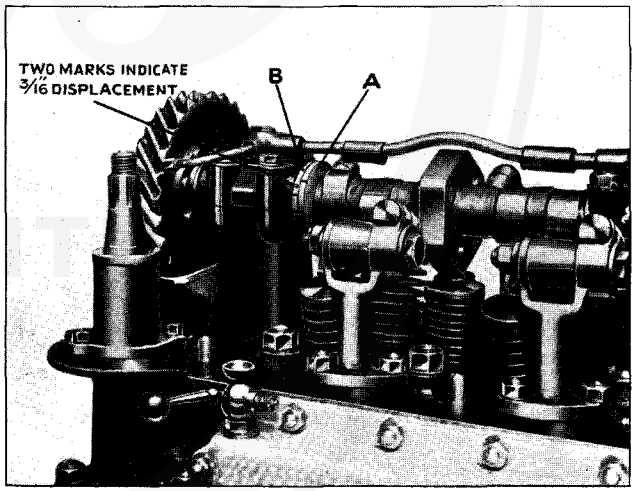


Fig. 31.

flange (B) corresponding to it, then rotate the camshaft backward so that the marks are $\frac{3}{16}$" apart. Intermesh the pinion with the worm wheel and set it so that the splines come true to one another, then rotate the worm wheel, pressing the screw pinion downwards on to the shaft when the marks should again come opposite.

GRINDING-IN VALVES.

Remove the tappet levers, detaching same from the cylinder head, together with their pedestals (A - Fig. 27). Press the valve springs down with a screwdriver (Fig. 32) ; remove the split collars from the valve stems and release the spring slowly. Withdraw the washer and spring. The valves can now be removed.

It will be noticed that the valves are numbered on the stem by the split collar, and the valves should be ground into and reassembled in the seats from which they were removed.

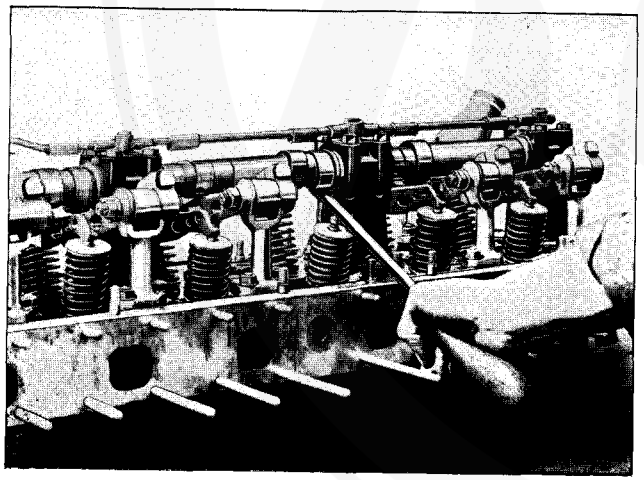


Fig. 32.

The valves should be placed in the seatings and ground in one by one, the seats being dressed with either Emery of No. 90 or 100 grade and paraffin, or with carborundum grinding paste. Place the valve in position, grip the stem in a drawback collet provided for the purpose, rotate the valve to and fro about half a turn in each direction, frequently lifting it from its seat. Occasionally wipe off the paste and redress it, repeating the process until a good clean seating contact is shown. (It is advisable to remove the induction pipe to facilitate the cleansing of the ports of any grinding compound which might collect there).

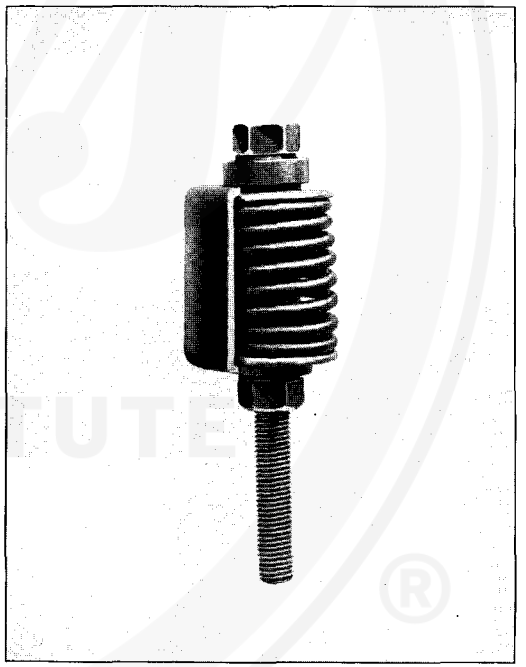


Fig. 33.

In order to test the accuracy of the grinding it is best to wipe all traces of paste and oil from the seats, lay an even coat of soot on the valve head by smoking it over an oil flame or wax taper, replace the valve—taking care not to let it come down carelessly on the seat—press the seat lightly home and turn it to and fro about $\frac{1}{8}$". A good contact will be apparent by the regularity of the surface from which the smoking is removed.

To replace the valve spring, place the valve spring washers, (top and bottom), in position on the spring, close it with the bolt and bolt washers provided, and insert the spring into one of the half sockets (as in Fig. 33), remove the bolt and bolt washers, thread the spring over the valve stem and replace the split collars. Prise off the half socket with a screwdriver and the valve spring on releasing will hold the valve spring washers and split collars in position.

ADJUSTMENT OF CARBURETTOR.

The circumstances which necessitate the dismantling of the carburettor only arise in event of it being necessary to change a jet or to clean the jets owing to the presence of water or dirt in the apertures. The choke pillar requires dismantling only in event of dirt accumulating and interfering with the free motion of the piston valve—a very rare occurrence.

To dismount the jet platform :-

1. Turn off petrol supply at autovac (P - Fig. 11, page 21).
2. Disconnect float chamber union (33 - Fig. 3).
3. Disconnect air control link.
4. Disconnect the throttle spring.
5. Unscrew the jet platform stud (D - Fig. 34), which is then removed together with the air control lever, throttle spring arm, jet platform and float chamber.

Access to the choke pillar and automatic piston valve is obtained by proceeding as in removal of jets, operations 1 to 4.

Remove the four nuts from studs (E - Fig. 34) which secure the choke piller flange (F) to the carburettor body (G), lower the choke pillar and float chamber until clear of the carburettor body and remove.

The automatic piston valve (H - Fig. 34) is not attached to the choke trunk and can be readily withdrawn.

Autovac. It is seldom necessary to dismantle the Autovac, but in event of doing so care should be taken to remove the float chamber without damaging the joint gaskets. When replacing, smear joints with

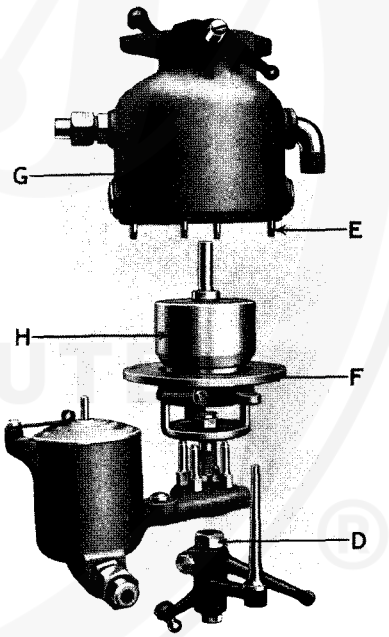


Fig 34.

Hermetite, (a tin of which is included in the car tool kit). If a joint gasket be damaged, replace it with a new one; as the functioning of the Autovac depends on the joints being air tight. In order to recharge the Autovac in event of it running dry, it is usually sufficient to drive the engine a few turns by means of the starter, *with the Throttle closed*, or failing this fill the carburettor float chamber and start the engine. Alternatively remove the Autovac Feed Pipe and attachment (E - Fig. 8) and prime the Autovac with about ½ pint of petrol.

REMOVING THE MAGNETO.

Fully retard the ignition lever, remove the distributor block (A - Fig. 35) and the contact breaker inspection cover (B), turn the engine until the contact points are just parting and note the position of the

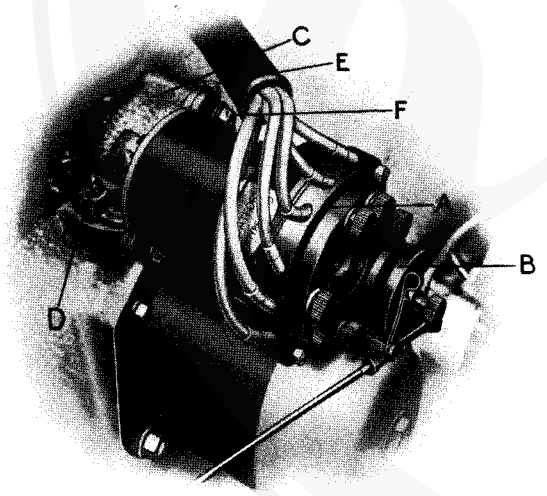


Fig. 35.

distributor brush (see separate booklet), remove the chain case cover (C-Fig. 35) -this is secured by two nuts (D & E) holding it to the crankcase and one bolt (F) attaching it to the flange of the magneto -and unscrew the nut which holds the sprocket on to the magneto spindle; the unscrewing of this nut automatically withdraws the sprocket. Remove the two remaining magneto flange nuts and the magneto can then be withdrawn from the crankcase.

In replacing the magneto, see that the ignition lever is still fully retarded, turn the magneto spindle until the distributor brush is making contact with the same segment as it was on removal and that the contact breaker is just breaking contact, lift the sprocket and chain, making quite sure that the links are on both sprockets at the bottom—it is possible to get only one series of chain rollers engaged with one half of the sprocket, the other portion overhanging—push the magneto into position, threading the sprocket on to the spindle, and reassemble the sprocket nut on to the spindle. Replace the magneto base nuts and adjust the chain so that slogger is barely perceptible.

Before finally tightening the sprocket nut check the magneto timing points to see that the engine and magneto have not moved relatively.

In tightening up the sprocket nut, prevent the magneto spindle from turning by holding the contact breaker centre pin with the magneto spanner provided.

After checking the ignition timing and tightening up the sprocket, replace the chain case cover and nuts. N.B. For cars produced prior to No. 3315 the removal of the sprocket nut does not withdraw the sprocket, which has to be detached from the magneto spindle by using a hammer and a brass drift. A sharp tap with the hammer will dislodge the sprocket from the taper on the magneto spindle. Care should be taken with this type when removing the nut and washer not to drop same into the chain case.

THE CARE AND PRESERVATION OF MOTOR BODY WORK.

The Motor House should be kept airy and dry and moderately lighted, otherwise the colours of the carriage will be impaired. The house should, if possible, be kept at a temperature exceeding 50 degrees F.

Whenever the car is kept standing for days together, it should always be covered by a large linen sheet, of sufficiently close texture to keep the dust off without excluding the light.

N.B.—Care should be taken to keep the dust sheet dry.

A car should never, under any circumstances, be put away dirty.

When a car is new or newly painted, it is better for it to stand for a few weeks before being used—even then, however, it will stain or spot unless care be taken to remove the mud before it dries on.

In washing, keep the car out of the sun. Use plenty of water, which apply where practicable with a hose or syringe, taking great care that the water is not driven in to the body to the injury of the lining or upholstery. When forced water is not obtainable use a large soft sponge; this when saturated squeeze over the panels, and by the flow down of the water the dirt will soften and harmlessly run off; then finish with a soft chamois leather and polish with an old silk handkerchief.

The same remarks apply to the under work and wheels, except that when the mud is well soaked, a soft mop, free from any hard substance in the head, may be used instead of a sponge. Do not use your panel leather for axles and under work, a separate leather should be used, as it is liable to become greasy.

For the wheels *excepting in the case of wire wheels* the spoke brush should be avoided, as when the

grit gets amongst the bristles of the brush, it acts like sandpaper on the varnish, scratching it and effectually scouring the gloss off. Persistent use of the spoke brush on coach finish will eventually rub off the varnish and paint. Wire wheels being stove enamelled will stand the spoke brush without injury.

N.B.—In order to preserve the colour and varnish on the Bonnet it is advisable when garaging the car after a long run, to open the Bonnet and remove the top. This particularly applies to cars finished in delicate colours such as grey or fawn.

When washing the car after a run it is advisable to leave the Bonnet until last.

Never allow water to dry itself on a car, as it will invariably leave stains.

Where tool boxes or accessories lockers are made detachable, they should be removed when washing the car.

To renovate the panels or to remove spots or stains on the varnish, a few drops of furniture polish or linseed oil put on a "swab" or "dab" made of woollen rags (using as little of the fluid as possible) will generally suffice. If the panels are badly spotted nothing but a regular flatting down and re-varnishing will be effectual.

Japanned or "patent" leather may be easily revived by the process described for renovating the varnish.

A car having a folding head should never be allowed to stand in garage with the head folded—otherwise it will soon get to look shabby through being creased. The head should be washed accasionally with soap and water and then lightly rubbed over with olive oil. In the case of an old head leather, it should be well washed with soap and warm water, and while the leather is still wet a good dressing of neatsfoot oil

should be applied. This should be allowed to remain until the leather is thoroughly dry and then well brushed with a soft brush. It will sometimes be found advantageous to finish by polishing the hood with a little harness composition (paste, not liquid).

Never clean leather upholstery with petrol or other spirit or wash with strong alkaline soap. Dirt can be removed by gently washing with a good super-fatted soap—ordinary curd soap is safest.

To freshen up leather upholstery rub over with a soft rag slightly moistened with olive oil.

For cleaning cloth upholstery a carpet soap may be used (obtainable from chemists and generally termed "cloth ball." In the event of the upholstery becoming greasy, however, it may be necessary to resort to petrol in order to effectually cleanse it.

To prevent or destroy moths in woollen upholstery use turpentine and camphor. Place some in an open pan or saucer. This mixture when placed in a closed carriage, completely shut up, is a certain remedy.

Keep a small bottle of black japan and a brush to touch up the wheels and axles, or places on the chassis, should the enamel chip. Lay it on as thin as possible. Never allow a chipped place to get rusty, as the rust will eat under the surface of the surrounding enamel and blister it off.

In cleaning metal work be careful non to smear the upholstery or paint with the polish. In cleaning silver or electro silver plate care should be taken to use only the finest jewellers' polish. The ordinary plate polish and the liquid polishes commonly used are too abrasive for cleaning silver plating.

If it is necessary to leave a car idle in motor house for long periods, it should occasionally be drawn out into the open air, and if a headed car the hood opened to air the interior.

Instructions for Folding Hoods.

IN order to prevent undue wear and preserve the appearance of Touring Car Hoods it is necessary to exercise care when folding, otherwise unsightliness quickly develops and the material becomes damaged in such a way as to destroy the efficacy of the hood.

The following instructions and illustrations are intended to give assistance in the folding of hoods on the 21 H.P. Lanchester Touring Cars, and by carefully following them it will be found that the operation is quite a simple one, and the hood will retain its appearance and usefulness throughout a long life.

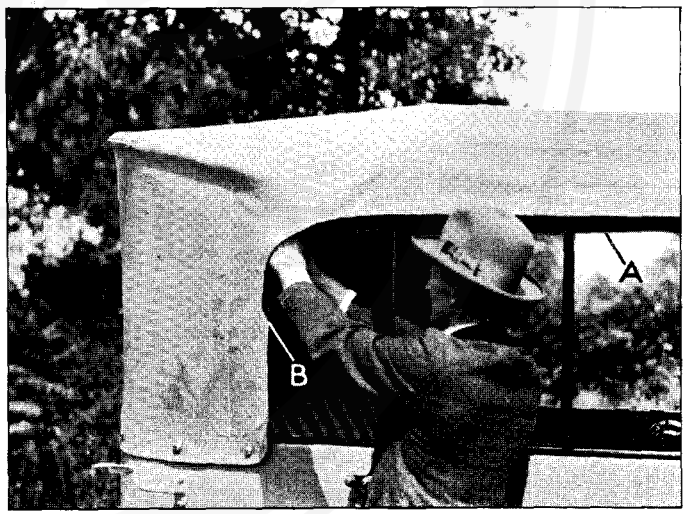


Fig. 36. Releasing the Draught Curtain from the Fly.

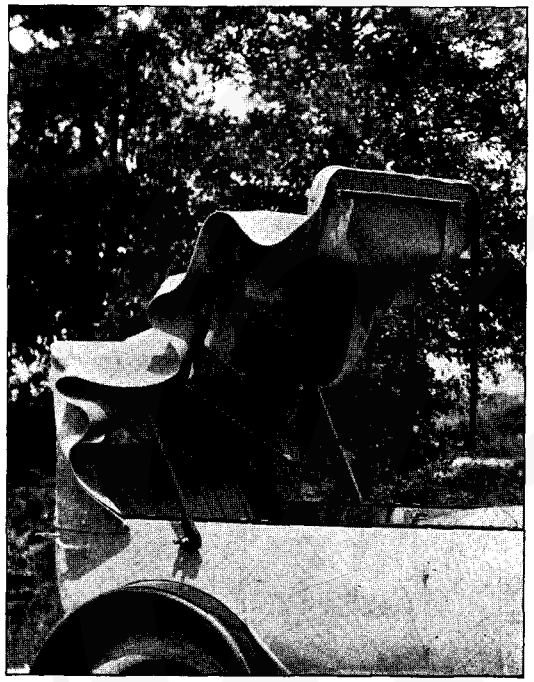


Fig. 37. Showing Hood in half-closed position.

See that the draught curtain A (Fig. 36), fixed inside the hood for use with loose side curtains, is buttoned to the studs in the roof of the hood and unbuttoned from the fly B. Release the wing nuts at the top of the wind screen and push the hood in an upward and backward direction until it is half folded (Fig. 37). Now allow the hood to close by its own weight as far as it will go automatically, then pull the material outwards from between the sticks (Fig. 38). The loose material should now be rolled up and packed neatly into the crevice thus formed between

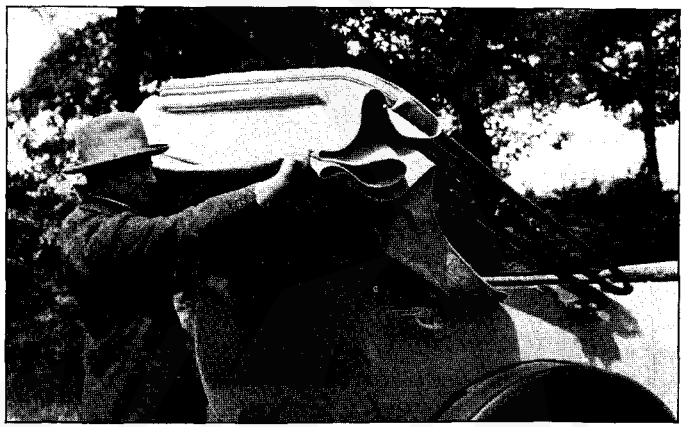


Fig. 38. Pulling Material from between Sticks.

the top and bottom sticks (Fig. 39), the corners then being folded over (Fig. 40). The hood is now in readiness for the envelope, which should be drawn on tightly and the ends strapped round the hood

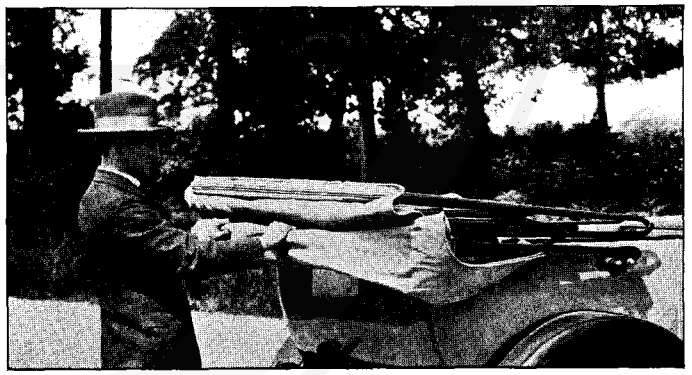


Fig. 39. Rolling up loose Material.

Tools and their Uses.

On the opposite page will be found illustrations of some of the Spare Parts and Tools supplied with the Lanchester 21 H.P. Chassis. A description is given below.

1 Cylinder Head Gasket.
2 Tin of Hermetite. Jointing Material.
3 Grease Gun with adaptor for Wheel Hubs.
4 Cylinder Head Box Spanner.
5 Exhaust Header Gasket.
6 Exhaust Pipe Gasket.
7 Petrol Filter Gauze.
*8 Wheel Brace.
9 Water Pipe Rubber Joint.
10 Loco Oiler.
11 Cylinder Foot Joint.
12 Spring Clip for Water Pipe Joint.
13 Screw Clip for Water Pipe Joint.
14 Oil Filter Gauze.
15 Oil Gun and Flexible Connection. (Two Flexible Connections are provided, Oil and Grease).
16 Valve Grinding-in Tool.
17 Brake Shoe Adjustment Spanner.
18 Throttle Tension Spring.
19 Brake Link Tension Spring.
20 Petrol Filler Joint Ring.
*21 Valve Rod.
22 Valve Springs.
23 Spoon Lever for Medium Pressure or Balloon Tyres.
24 Box Assorted Bolts, Studs, Nuts and Washers, etc.
25 Combined Spanner for Hub Caps, Oil Filter, & Adjustment of Steering Column.
26 Magneto Adjustment Span'r.
27 Valve Clearance Gauges.
28 Bonnet Key.
29 Magneto File.
30 Spring Gaiter Cuff Link.
31 " " "
32 Thermostat Cover Joint.
33 Vertical Shaft Adjustable Bush Spanner.
*34 Wheel Fitting Tool.
35 Tyre Lever supplied with Straight-sided Tyres only.
36 Carburettor Jet Box Spann'r.
37 Valve Spring Compressor.
38 Magneto Chain.

* *In connection with these items marked * separate illustrations are given showing the tools in actual use.*

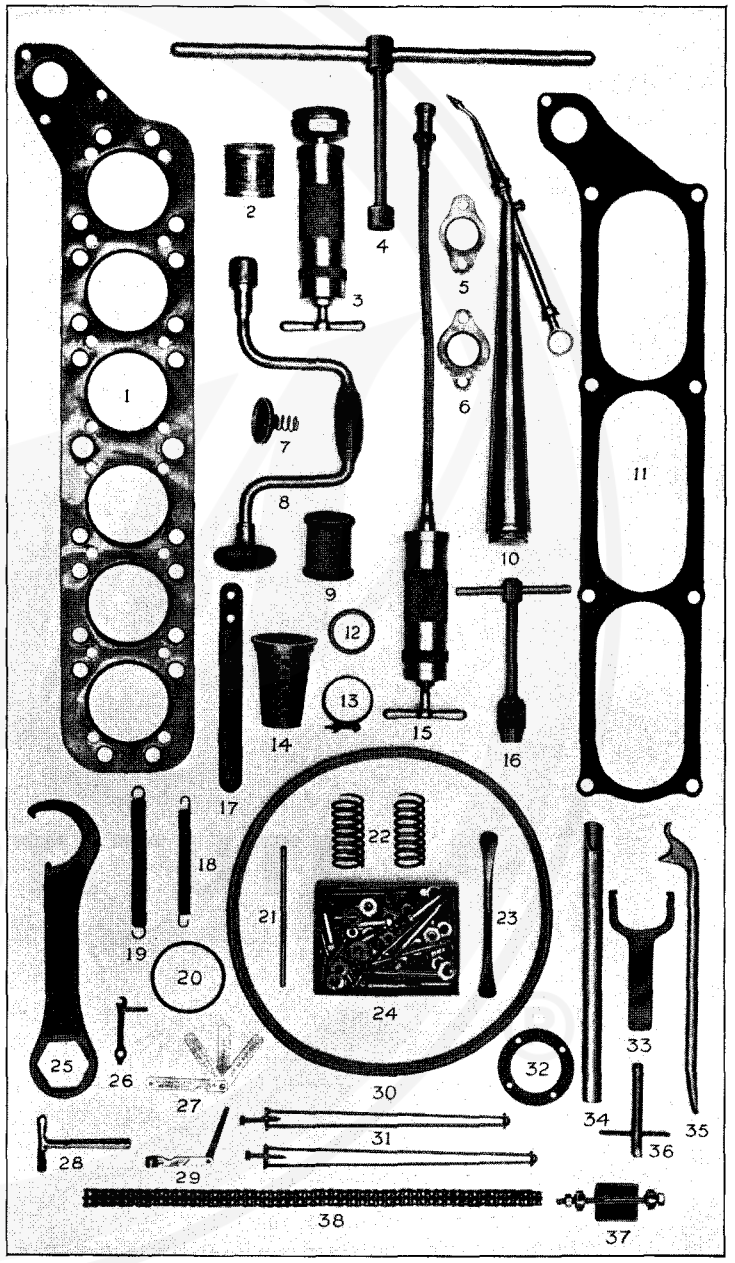


Fig. 43 shows the wheel brace being used to facilitate the jacking up of the car. For this purpose the end of the lifting jack handle is hexagon shaped.

The function of the Valve Rod No. 21 is to prevent the valve dropping down into the cylinder-head when the valve spring is being removed. The Valve Rod A Fig. 44 is inserted in the sparking plug hole until it is felt to enter a hole in the exhaust side of the cylinder-head, it thus supports both the inlet and exhaust valves, the springs from which can now be easily removed. The method used for removing is described in Fig. 32 page 60.

The wheel fitting tool No. 34 is provided to render the changing of a wheel an easy and simple operation. Fig. 45 shows the tool in use for fitting a rear wheel. To prevent the wheel hub re-

Fig. 43.

volving under the weight of the wheel put on the hand brake ; now insert the wheel fitting tool into one of the stud holes in the wheel allowing the spoon shaped end of the tool to rest on the top stud on the wheel hub. Lever up the wheel with the fitting tool and apply a little pressure with the foot to the bottom of the tyre when it will be found that the wheel will slide into position.

When fitting a front wheel it is advisible, if assistance is not at hand for the purpose of holding the

Fig. 44. Showing Valve Rod in Use.

brake on, to use the wheel fitting tool in conjunction with the bottom stud on the hub, otherwise the weight of the wheel will cause the hub to revolve.

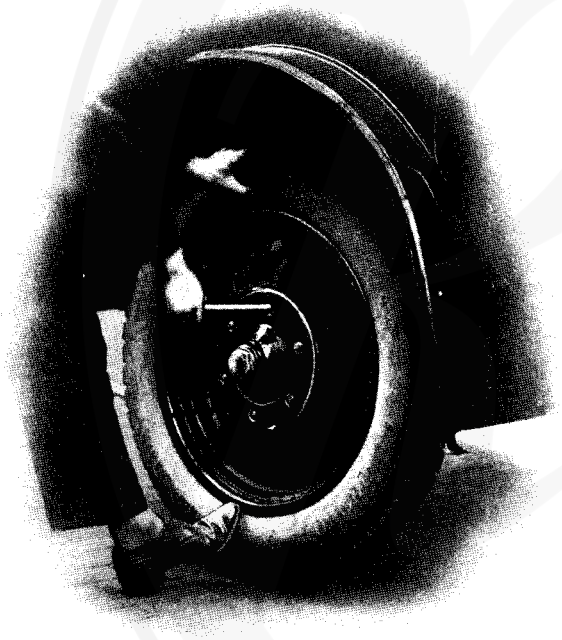
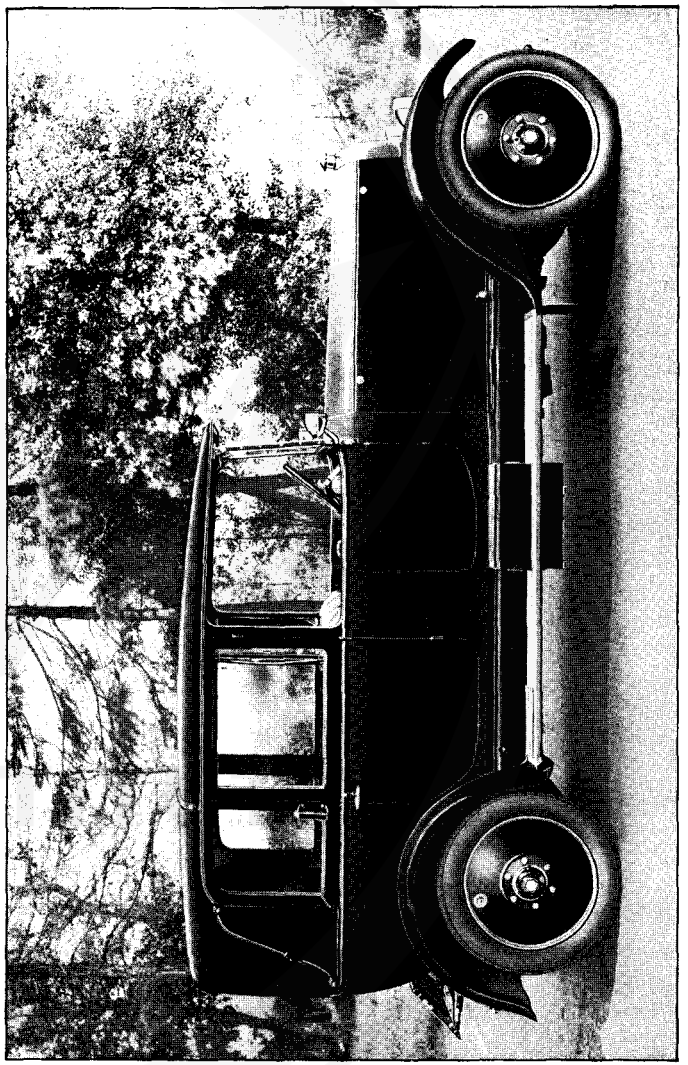


Fig. 45.



21 h.p. 6-Cylinder Lanchester 6-Seat Three-quarters Landaulet.

In the foregoing description we have endeavoured to furnish all information necessary to the maintenance and good running of our cars, but owing to detail changes, errors and omissions will necessarily occur, and whilst we always endeavour to keep the booklet up-to-date, we are unable to hold ourselves responsible for failures due to lack of information.

Although our guarantee expires two years from date of delivery (see Catalogue) we make a point of studying the interests of our Customers at all times, and are always pleased to give advice as to maintenance, or assistance enabling owners of our Cars to obtain the best results from them.

Our Service Department will render Service at any time, day or night, and we are usually able to despatch Spare and Replacement parts immediately on receipt of instructions. Small delays are occasionally unavoidable.

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