

The LANCHESTER FORTY.



DESCRIPTIVE MANUAL.



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40-h.p. 6-cylinder 7 seat Lanchester Enclosed Drive Limousine.

The Lanchester Forty.

PREFACE.

THE following pages contain a description of the 40-h.p. Lanchester, a Car which for comfort and luxury will satisfy the most critical, and in which a higher standard is established, both in material and workmanship, than has hitherto been employed in Automobile manufacture. At the same time it has been our aim to offer to the public a Car, clean and simple in design, and requiring a minimum amount of running attention.

In the production of this Car neither trouble nor expense is spared in tool equipment and the selection of material. High grade alloy steels are extensively employed throughout Engine and Chassis, all steel being subjected to the most up-to-date scientific treatment in our own Factory, and the high standard of quality is maintained by a rigorous system of testing, both mechanical and in our metallurgical laboratory; and with this, the employment of skilled labour of the highest excellence, combines to produce a Car that in quality of design, material and workmanship, we may confidently assert is second to none.

General Description.

Power Unit. Following our practice established over 17 years ago, the crankcase and gearbox are bolted together forming a single oil-tight casing of rigid construction enclosing the running mechanism of engine and gearbox. Accurate alignment of the crankshaft and transmission gears is thereby ensured. The advantages of this form of construction were recognised at an early date by Dr. F. W. Lanchester; and the construction, embodied in his designs of 1904, has been a feature of Lanchester Cars ever since. To-day it is widely adopted both in America and Europe, and appears likely to become standard throughout the trade. The power unit is carried in the chassis by two arms at the front end extending to the chassis members, and at the rear by a pair of brackets which extend on each side of the brake drum and are bolted to the transverse member, which also carries the socket of the torque tube.

The Engine. 38.4 Treasury Rating, has six cylinders, vertical, 4-inch bore by 5-inch stroke. It has overhead valves and camshaft, worm driven, totally enclosed and automatically lubricated. High pressure forced lubrication, spray carburettor and water jacketted induction pipe, two independent ignition systems, water circulation by centrifugal pump, a large exhaust manifold, and electric starter and generator designed integral with the engine.

The Gear Box is of the usual Lanchester silent epicyclic type and contains three forward gears and one reverse, the top gear being direct and the other gears being epicyclic. The direct drive is by a single plate

GENERAL DESCRIPTION.

clutch enclosed in the fly-wheel, and the epicyclic clutches are of the usual hard steel friction blocks acting on a hardened steel drum. The gear box brake is of the orthodox internal expanding type and is mounted on the transmission shaft externally (that is, not enclosed within the gear box), adjacent to the cardan shaft joint.

Chassis. The chassis frame, though commonplace in external appearance, possesses many features which place it in a class by itself. The large diameter tubular transverse member and partially tubular side members make for great strength and rigidity, which contributes to the durability and silence of bodywork. The chassis channel members are also of exceptional width, imparting lateral stiffness to the frame.

The Rear Axle. The axles are of the floating type and the road wheel hubs are supported on ball and roller bearings mounted on the axle casing tubes. Secured to the hubs are powerful internal expanding brakes of large diameter. The axle casing consists of three members, the centre containing the worm transmission gear and differential, and the side members enclosing the axles in an oil bath and carrying suspension brackets, brake brackets and road wheel bearings.

Transmission is by a cardan shaft enclosed within the torque tube, the cardan joint being situated concentrically within the torque tube ball. The final transmission is identical with that used in the Lanchester Car from its inception, i.e., by the well-known Lanchester high efficiency worm gear. The worm, mounted beneath the rear axle, is immersed in oil and perfect lubrication is thereby ensured. The worm and worm wheel are carried in massive roller and ball bearings,

GENERAL DESCRIPTION.

which are rigidly mounted, the differential gear being of the bevel type enclosed within the worm wheel.

The Front Axle is of orthodox appearance and consists of a nickel steel rail section drop forging, clean and simple in design. The stub axles and front hubs call for no special comment, being almost identical with those of our 1914 40-h.p. Car. Reference to these parts, however, is made in the Detail Description following.

Suspension. In the rear suspension the well-known Lanchester inverted half elliptic cantilever springs are employed. This type of suspension originated with the Lanchester and has been associated with Lanchester Cars from their commencement, over twenty years ago. It is rapidly becoming regarded as the correct form of suspension by the vast majority of automobile manufacturers throughout the world. Detail improvements are embodied in the method of anchorage of the springs to the chassis and the rear axle, and also in material and finish, all of which contribute to increased comfort in springing.

In view of the position on the chassis which the front passengers occupy it is deemed unnecessary to adopt Lanchester springing to the front axle, and the front springs are therefore of the ordinary semi-elliptic type secured to the underside of the front axle. This arrangement admits of an exceptionally clean and simple design of axle, and provides a greater underclearance than is customary.

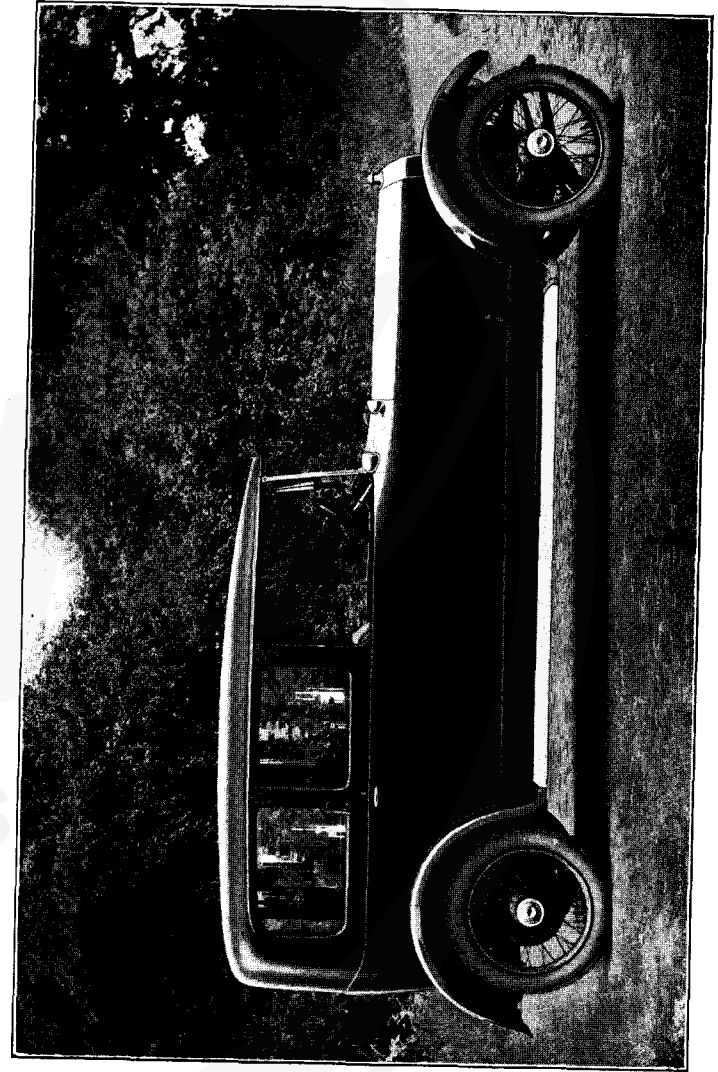
The lubrication of springs is ensured by the insertion alternately with the spring leaves of thin perforated brass leaves which are loaded with lubricant, and all springs are enclosed in stout leather gaiters.

GENERAL DESCRIPTION.

Steering. The steering gear and steering column are similar to those employed in our 38-h.p. Car, 1912 to 1914, improvement having been effected by the adoption of roller journal bearings to the steering trunnion. As is customary, the controls are mounted on the steering column, manette levers controlling the ignition and throttle, and a central knob controlling the carburettor. Unlike the orthodox arrangement, however, there are no exposed levers: cleaning is consequently simplified and an item in running attention eliminated.

Approximately 3 inches of adjustment is provided in the height of the steering column, and an alternative type of steering wheel may be supplied to suit the requirements of exceptionally tall drivers; and also both clutch, brake and accelerator pedals are adjustable to suit individual requirements; all adjustments being of the simplest kind.

Our hand brake and change gear levers are of exceptionally neat design, the necessity for pawls and their actuation mechanism having been eliminated.



40-h.p. 6-cylinder 7 seat Lanchester Limousine.

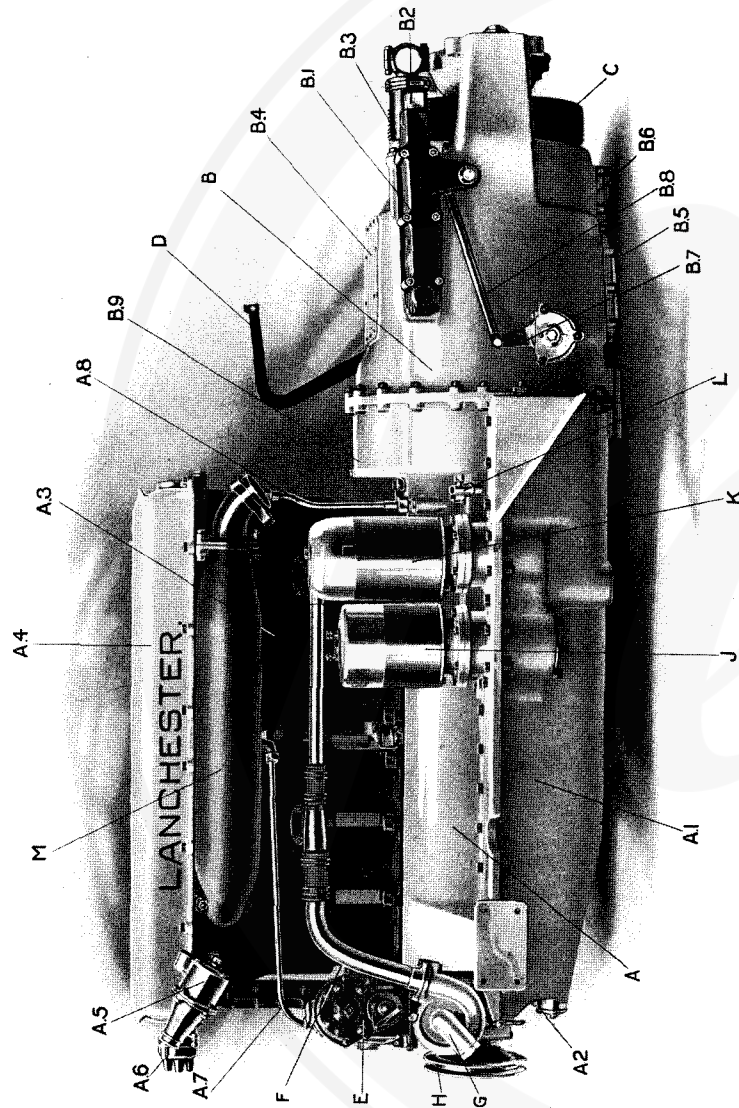


Fig. 1. Power Unit.

Detail Description.

Engine. (Figs. 1, 2, and fig. 3 facing page 16).
 As stated in the General Description, the engine has six vertical cylinders; these are cast in two blocks of three each. The combustion heads and valve chambers are cast integral with the cylinders, thus ensuring a free circulation of water round the most essential parts, viz., the valves and sparking plugs, and eliminating the possibility of water leakage and cylinder pressure leakage, to which detachable combustion heads are susceptible. The combustion space is of compact partially spherical form and is entirely machined; a process contributing to efficiency, and to evenness of running, and evading defects in combustion which commonly occur in engines having unmachined or partially machined combustion spaces.

Description of fig. 1.

- | | |
|--------------------------------|-------------------------------|
| A. Crankcase. | B.6. Gear Box Oil Pump. |
| A.1. Crankpan. | B.7. Clutch Lever. |
| A.2. Crankpan Oil Gauze Cover. | B.8. Clutch Adjustment Link. |
| A.3. Cylinders. | B.9. Fly-wheel Casing. |
| A.4. Valve Cover. | C. Countershaft Brake Drum. |
| A.5. Thermostat. | D. Clutch Pedal. |
| A.6. Distributer. | E. Magneto. |
| A.7. Oil Pipe. | F. Water Pipe. |
| A.8. Oil Pipe. | G. Water Pump. |
| B. Change Speed Gear Box. | H. Fan Pulley. |
| B.1. Gear Push Bars Housing. | J. Starting Motor. |
| B.2. Gear Push Bars. | K. Generator. |
| B.3. Clutch Spring Box. | L. Oil Pressure Relief Valve. |
| B.4. Gear Box Inspection Lid. | M. Exhaust Manifold. |
| B.5. Gear Box Oil Sump. | |

DETAIL DESCRIPTION.

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 materially increased by employing wide flanged oil joints and a large number of bolts securing them to each other. The main bearing brackets are carried by massive webs cast transversely in the crankcase. The oil base (fig. 4) is provided with a gauze filter of large area, which may be withdrawn through an aperture in the front end without draining out the oil. The oil filler (fig. 2) is mounted on the offside engine bracket at the forward end of the crankcase in a most accessible position. Towards the rear end of the crankcase, and visible to the operator when filling with oil, is provided an oil level gauge (fig. 2) consisting of a small float, the stem of which protrudes. An overflow cock is provided for use in event of over-filling, and on the base beneath the oil level gauge is a plug (fig. 2) for the periodical draining of the oil sump.

Description of fig. 2.

- | | | | |
|-------|------------------------------|-------|---|
| A. | Crankcase. | B.12. | Reverse Gear Adjustment Nut. |
| A.1. | Crankpan. | B.13. | Low Gear Adjustment Nut. |
| A.2. | Crankpan Oil Gauge Cover. | B.14. | Compound or Second Gear Adjustment Nut. |
| A.3. | Cylinders. | C. | Countershaft Brake Drum. |
| A.4. | Valve Cover. | D. | Clutch Pedal. |
| A.6. | Distributor. | D.1. | Clutch Pedal Adjustment Link. |
| A.7. | Oil Pipe. | D.2. | Clutch Actuating Lever. |
| A.9. | Crankcase Oil Filler. | H. | Fan Pulley. |
| A.10. | Crankcase Oil Level Gauge. | N. | Magneto. Gear Housing. |
| A.11. | Crankcase Oil Level Cock. | O. | Vertical Shaft Housing. |
| A.12. | Crankcase Oil Drain Plug. | P. | Inlet Pipe. |
| A.13. | Valve Timing Inspection Lid. | Q. | Priming Cocks. |
| B. | Change Speed Gear Box. | R. | Water Circulation Pipe. |
| B.3. | Clutch Spring Box. | S. | Sparking Plugs. |
| B.4. | Gear Box Inspection Lid. | T. | Carburettor. |
| B.5. | Gear Box Oil Sump. | U. | Countershaft Brake Actuating Lever. |
| B.10. | Gear Box Oil Filler. | | |
| B.11. | Gear Box Oil Level Cock. | | |

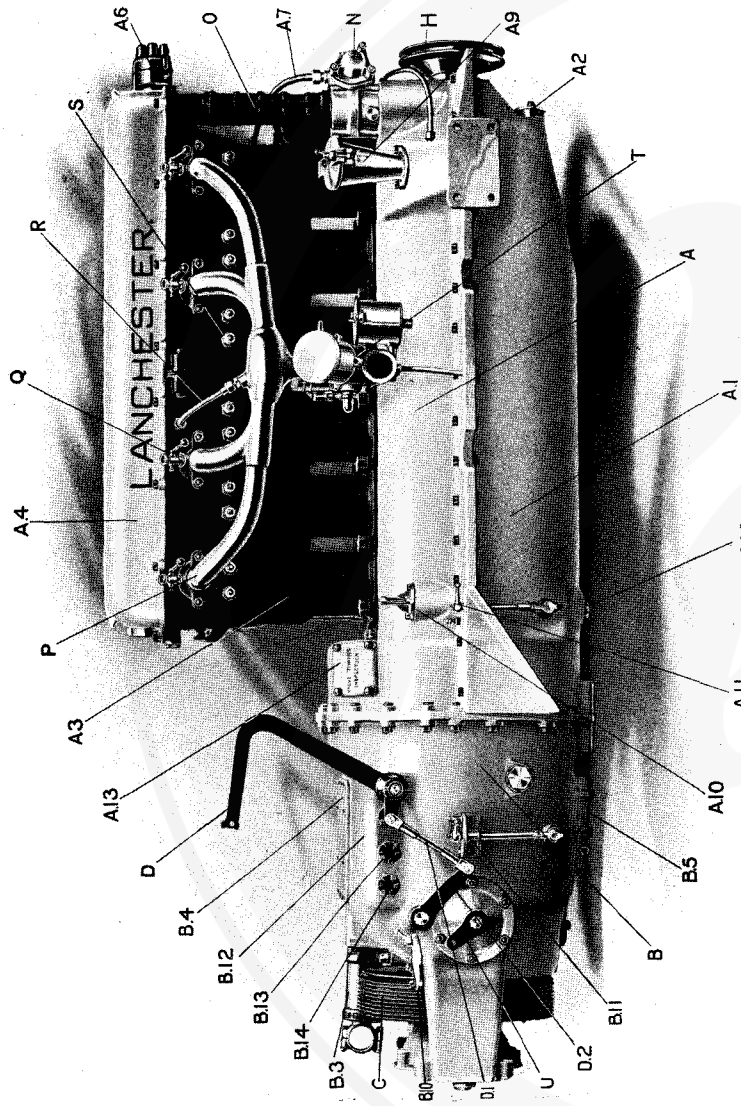


Fig. 2. Power Unit.

DETAIL DESCRIPTION.

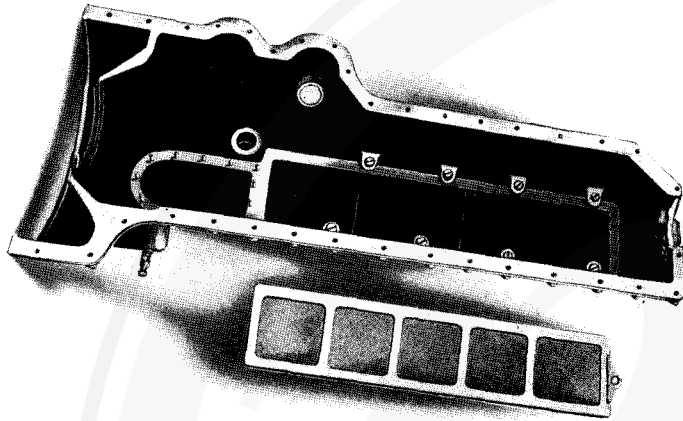
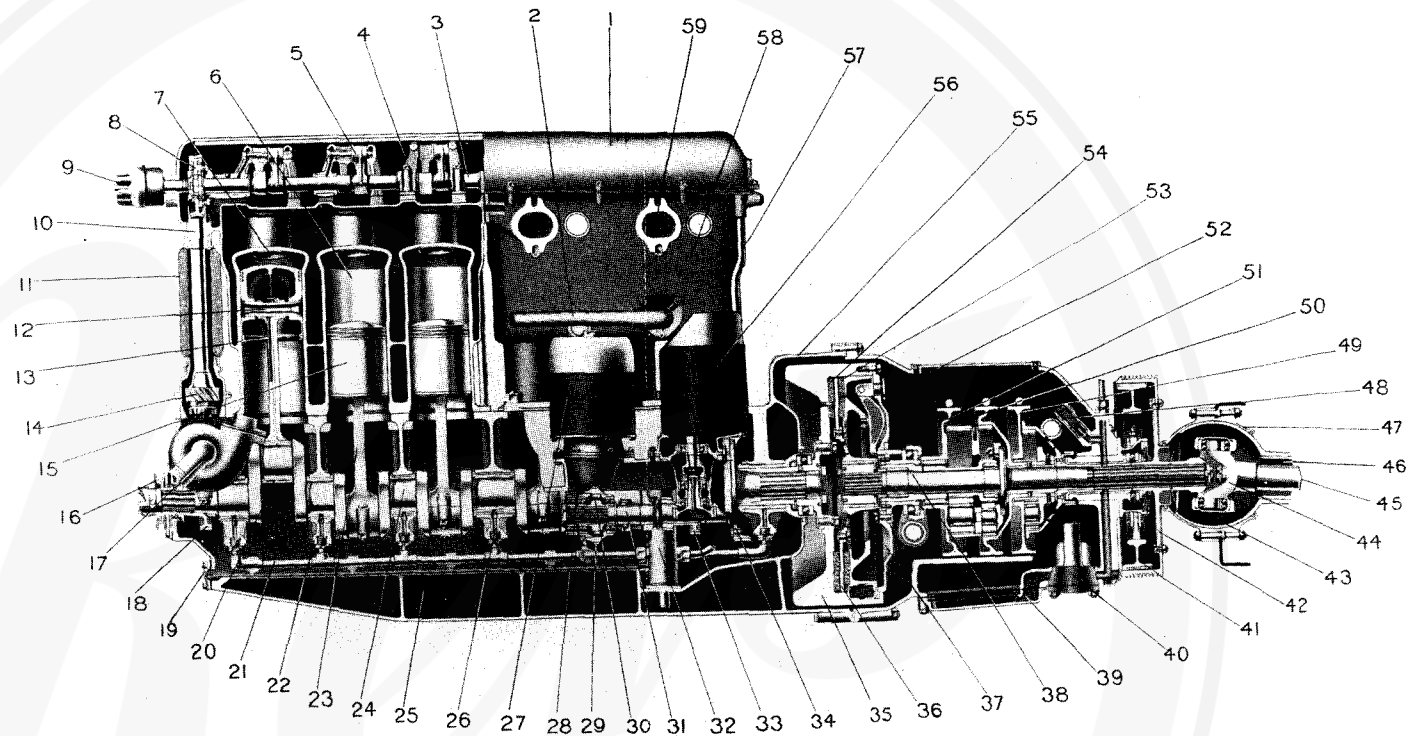


Fig. 4.

Lower half of Crankcase showing Oil Sump and Gauze Filter.

Crankshaft. The crankshaft (fig. 5) is of exceptionally robust design. It has six independent throws and is supported by a bearing between each pair, i.e., seven bearings in all. The crank is of hollow formation, the shaft and the 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.

Pistons. (Fig. 6.) Are aluminium alloy die cast, this material having been adopted by us only after a successful test of six years' duration. Four piston rings are employed, one of which—conforming to our practice of the past 16 or 17 years—is placed at the extreme bottom of the skirt and acts as an oil scraper, which prevents over lubrication of pistons and consequent carbon deposit in combustion space. The gudgeon pin is case-hardened and is made tubular in



Description of Fig. 3 (Engine Section).

- | | | | | |
|------------------------------------|--|--|-------------------------------------|---------------------------------|
| 1. Valve Cover. | 14. Magneto Drive Shaft
Worm Wheel. | 24. Crankshaft. | 37. Clutch Cover Plate. | 49. Compound or Second
Drum. |
| 2. Water Circulation Pipe. | 15. Piston. | 25. Oil Base. | 38. Gear Box Centre Shaft. | 50. Low Gear Drum. |
| 3. Camshaft. | 16. Fan Pulley. | 26. Crankshaft Bearing Cap
Oil Way. | 39. Gear Box Oil Sump. | 51. Reverse Gear Drum. |
| 4. Camshaft Bracket. | 17. Centrifugal Water Pump. | 27. Starter. | 40. Countershaft Oil Pump. | 52. Gear Box. |
| 5. Valve Tappet Lever. | 18. Vertical Shaft Worm
Wheel. | 28. Starter Drive Housing. | 41. Countershaft Brake Shoe. | 53. Fabric Clutch Disc. |
| 6. Cylinder. | 19. Oil Gauze Cover. | 29. Starter Worm Wheel. | 42. Countershaft Brake Drum. | 54. Fabric Clutch Disc. |
| 7. Inlet Valve. | 20. Connecting Rod Big End
Bearing. | 30. Starter Free Wheel Clutch. | 43. Torque Tube Ball. | 55. Flywheel Casing. |
| 8. Camshaft Worm Wheel. | 21. Oil Pipe. | 31. Layshaft. | 44. Universal "Hooks" Joint. | 56. Generator. |
| 9. Distributor. | 22. Crankshaft Main Bearing
Cap. | 32. Engine Oil Pump. | 45. Cardan Shaft. | 57. Oil Pipe. |
| 10. Vertical Shaft. | 23. Connecting Rod. | 33. Generator Worm Wheel. | 46. Torque Tube. | 58. Cylinder Water Jacket. |
| 11. Vertical Shaft Casing. | | 34. Layshaft Driving Wheel. | 47. Torque Tube Spherical
Joint. | 59. Exhaust Port. |
| 12. Gudgeon Pin. | | 35. Flywheel. | 48. Oil Pressure Relief Valve. | |
| 13. Connecting Rod Oil
Conduit. | | 36. Clutch Disc. | | |

7
6
5

Second Gear
m.
Drum.
Disc.
Disc.
g.
Jacket.



Fig. 5. 40 h.p. Crankshaft.

DETAIL DESCRIPTION.

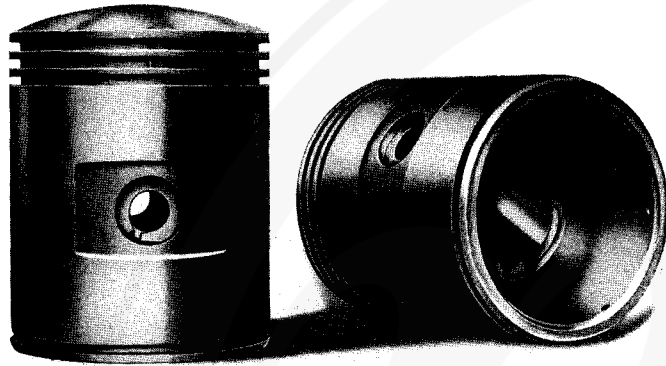


Fig. 6. Pistons.

order to save weight. A feature of our piston and gudgeon pin is that the latter is floating, i.e., it is free to turn in bearing bushes pressed into the gudgeon pin bosses, as well as in the connecting rod small end bearing. The gudgeon pin bushes are held in place by means of two spring circlips which are pressed into annular grooves formed in the bore of the piston bosses.

Connecting Rods. (Fig. 7). Are drop forged in high tensile steel, which is reduced in weight by machining all over, to the minimum consistent with the

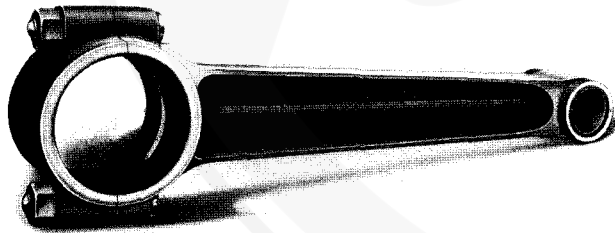


Fig. 7. Connecting Rod.

DETAIL DESCRIPTION.

necessary strength. The process of machining ensures the detection and elimination of all defects in the material or in process of forging. The connecting rod head is lined with a white metal bearing cast under pressure. Our process of casting 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.

Camshaft and Valves. Are placed overhead (fig. 8). The camshaft is situated longitudinally and lies between the feed and exhaust valves. The shaft is

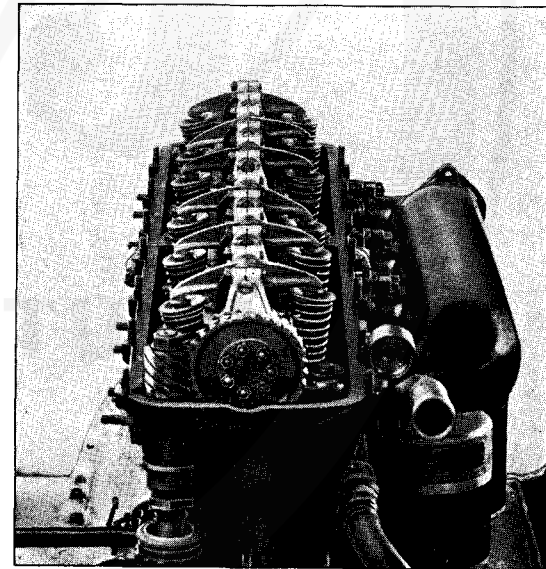


Fig. 8. Camshaft and Valves.

DETAIL DESCRIPTION.

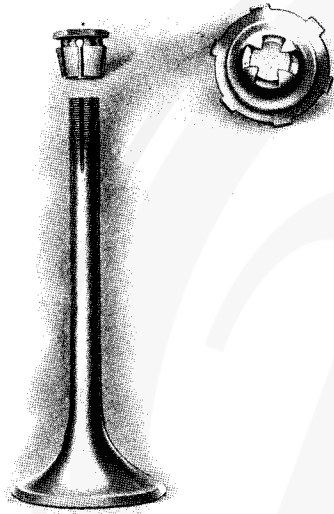


Fig. 9. Valve.



Fig. 10. Feed Valve.

made tubular in order to save weight and to form an oil duct. It is supported by seven white metal bearings of ample area. At the forward end is mounted a worm wheel which is driven from the crankshaft through the medium of a vertical shaft.

The Valves (fig. 9), of which there are two to each cylinder, are slightly inclined from the vertical, thus rendering them accessible for removal and replacement without dismantling the camshaft. The exhaust valve is on the nearside of the engine, and in order to ensure effective cooling, it seats direct into the cylinder head. The feed valve is housed in a detachable cage or seating (fig. 10) on the offside, the removal of which

DETAIL DESCRIPTION.

discloses a port through which the exhaust valve may be withdrawn. To effect a saving in weight the valve stems are tubular and the heads are bell-shaped. This shape is not only conducive to efficiency by facilitating the ingress and egress of the gasses, but also gives greater durability of the seating owing to its adaptable form. Our special arrangement of valves has advantages over all other overhead types in that we do not employ detachable cylinder heads, neither is it necessary to remove the cylinders to grind in the valves. The valve adjustment is effected by means of a taper split cap (fig. 9) which is screwed on to the valve stem. It is locked by a taper collar (fig. 9) which is integral with the valve spring washer. In order to prevent rotation of the valve during adjustment and consequent disturbance of the adjustment, the spring washer is provided with four nibs or keys, which engage in keyways cut in the valve stems.

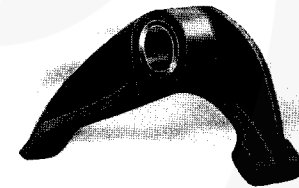


Fig. 11. Valve Tappet Lever.

The valves are operated by means of tappet levers (fig. 11) mounted on vertical extensions from the camshaft bearing, the tappet levers being carried on pins which are drilled to form an oil conduit. Both cam shafts and tappet lever bearings are lubricated by forced oil feed.

Valve Transmission. As previously stated, motion is transmitted to the camshaft by means of a

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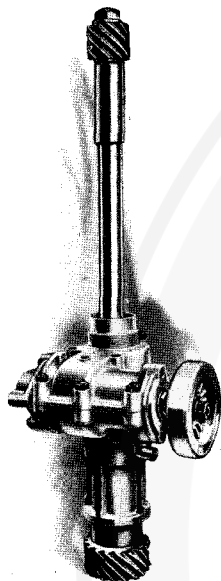


Fig. 12.
Vertical Shaft.

vertical shaft (fig. 12) driven by a pair of worm gears, the worm (fig. 3) of which is mounted on the crankshaft at the forward end, and the worm wheel (fig. 12) on the bottom end of the vertical shaft. At the upper end the vertical shaft is provided with a worm (fig. 12) driving the worm wheel on the camshaft. The vertical shaft and the whole of the valve gear is totally enclosed and automatically lubricated.

Ignition. Mounted on the lower portion of the vertical shaft is a gear wheel which drives the magneto through the medium of a stub shaft and corresponding gear wheel and a spring coupling (fig. 13). Two independent ignition

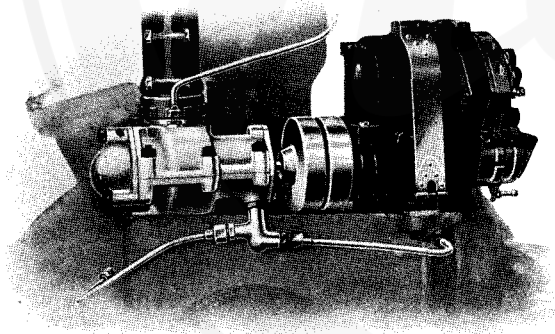


Fig. 13. Magneto Drive.

DETAIL DESCRIPTION.

systems are employed; magneto and high tension coil with battery. The magneto (shown in fig. 1) is placed transversely across the front of the crankcase, the contact breaker and such parts as are liable to require occasional attention being placed in a most accessible position.

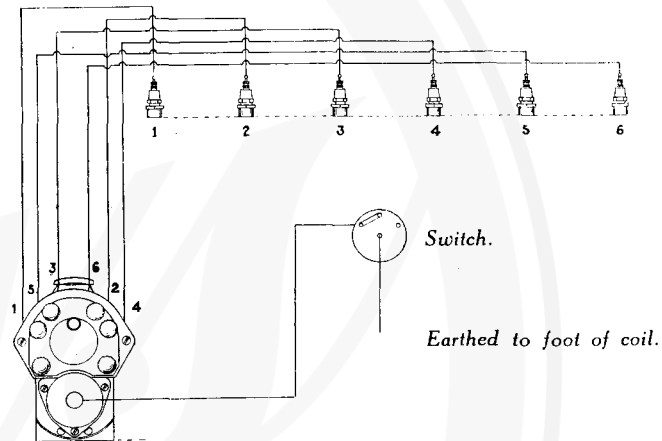


Fig. 14. Magneto Wiring Diagram.

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

The distributor of the battery system is mounted on the front end of the camshaft. Both the contact breaker and distributor elements are of well tried design, being almost identical with those universally employed in magneto machines.

Water Pump. The Water Pump (figs. 1 and 16) is of the centrifugal type and is situated immediately below the magneto and driven by worm gearing from the front end of the crankshaft. The rotor spindle is provided with a packing gland which is automatically adjusted by means of a spring, and is lubricated automatically by surplus oil from the valve transmission

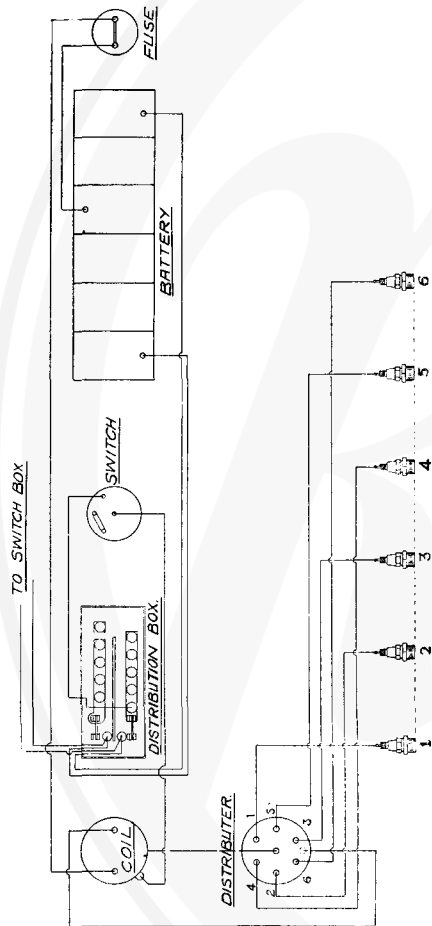


Fig. 15. Battery Ignition Wiring Diagram.
Order of firing; 1, 5, 3, 6, 2, 4, counting from front of Engine.

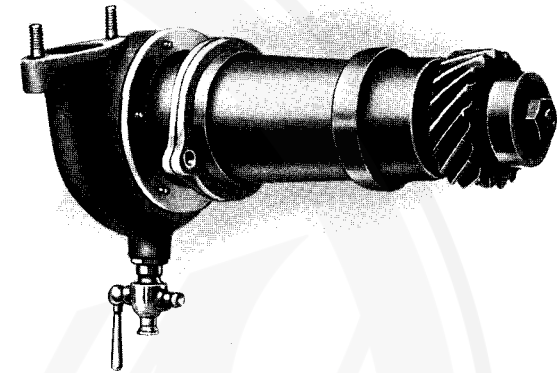


Fig. 16. Water Pump.

shaft housing. In event of water leakage taking place, provision is made whereby the water drains on to the road and cannot pass into the crankcase. The pump is driven through the medium of a rubber coupling of the Oldham type (fig. 17).

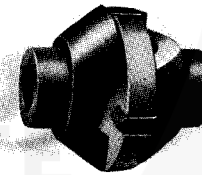


Fig. 17. Water Pump Coupling.

Circulation. The water circulation service is furnished with pipes of ample area. The delivery pipe from the pump is branched, one duct leading to each cylinder block. The water is admitted to the cylinder jackets at the bottom and near the rear end of each block, the return pipe to the radiator being situated

DETAIL DESCRIPTION.

at the extreme front end of the forward block of cylinders. The return service from the rearmost block of cylinders passes through the front block, the joint being made by means of a perforated strip of "Dermatine." The radiator (fig. 18) is of honeycomb type and is provided with a glass level gauge. Drainage of the water Service is effected by a drain tap fitted at the lowest point in the circulation, i.e., at the bottom of the radiator outlet pipe, and a drain tap is also provided in the bottom of the water pump to drain out the small residue, which is pocketed in the rotor

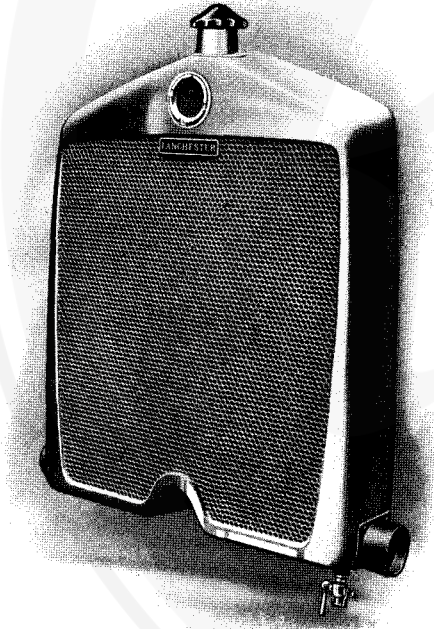


Fig. 18. Radiator.

DETAIL DESCRIPTION.

cavity. In event of the water being drained out in frosty weather, the latter should be emptied, as a small amount of ice may be destructive to the pump rotor when starting up.

Cooling Fan. The Cooling Fan is driven from a vee pulley on the front end of the crankshaft, by a leather-link belt. This has been found adequate and is more silent than other forms of driving mechanism. Provision is made for the necessary adjustment for belt wear, the method employed being self evident.

Layshaft. At the rear end of the engine (figs. 3 and 19) is provided a layshaft, driven by spur gear from the crankshaft. Its function is to drive the oil

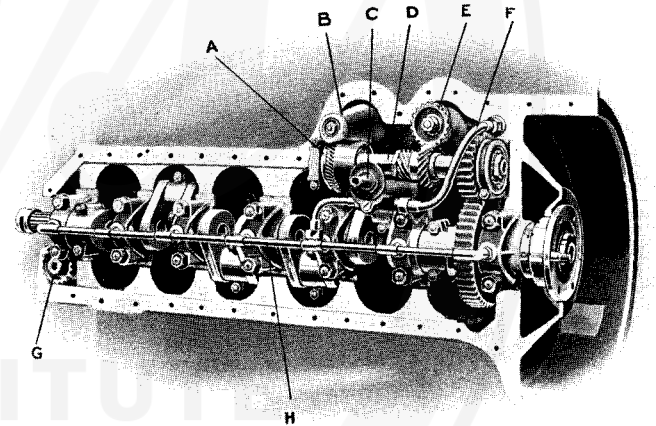


Fig. 19. Layshaft.

Description of Fig. 19.

- | | |
|--------------------------------|--|
| A. Layshaft Free-wheel. | F. Oil Relief Valve and Pressure Gauge Pipe. |
| B. Starter Worm Shaft Housing. | G. Vertical Shaft Worm Wheel. |
| C. Oil Pump. | H. Main Bearings Oil Pipe. |
| D. Layshaft. | |
| E. Dynamo Spiral Pinion. | |

DETAIL DESCRIPTION.

pump and electric generator, and it is also driven by the electric starter, the starter gears being arranged so that they come to rest and do not continue to revolve after the engine is started.

Lubrication. Is forced feed by gear pump (fig. 20). The oil is distributed under high pressure to the main bearings, connecting rod heads and small ends, pistons, camshaft bearings, and valve rocker bearings; the valve transmission gears and shaft, and all auxiliary mechanism, being lubricated by the continuous flow of oil returning to the oil sump. The oil pump is driven by a skew gear mounted on the layshaft (fig. 19), and runs practically immersed in oil. The pump and oil pipes are secured throughout to the crankcase and are therefore undisturbed when removing the oil base. The oil sump contains a fine mesh gauze filter of large area (fig. 4), which can be withdrawn for inspection without dismantling the oil base or losing oil.

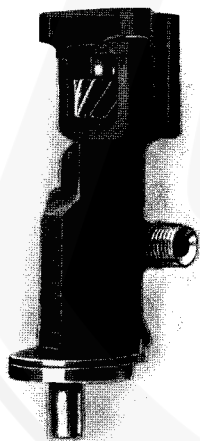


Fig. 20. Engine Oil Pump.

DETAIL DESCRIPTION.

A pressure relief valve is provided (fig. 1) which is adjusted to lift at 45lbs. per square inch; the excess of oil issuing from it returns to the oil base by gravity.

The lubrication is entirely automatic and requires no adjustment or attention, beyond the usual periodic emptying out of stale oil and replenishing, for which purpose a plug is provided in the base of the oil sump (fig. 2) and a filler of ample proportions is provided at the front end of the crankcase on the "offside." An oil gauge or "tell tale" is provided to register the oil level, consisting of a tubular aluminium stem having a float at its lower end; it is located in the crankcase on the off side approximately in line with No. 6 cylinder.

Dynamo. The Dynamo (figs. 1 and 3) is driven from the layshaft through the medium of skew gears and a short vertical shaft, the latter being mounted in a detachable housing (fig. 21) and coupled to the dynamo by a rubber universal joint of the Oldham type.

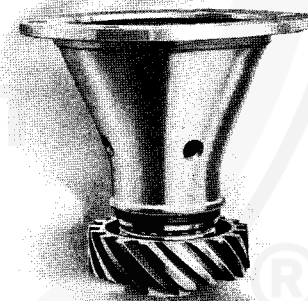


Fig. 21.

DETAIL DESCRIPTION.

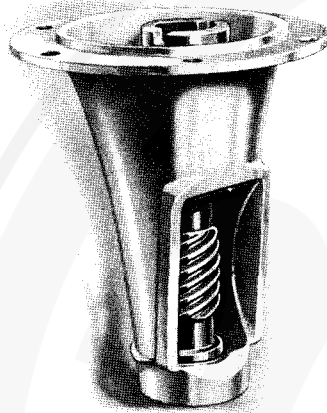


Fig. 22.

Starter. The Electric Starter engages with the layshaft through worm gearing (fig. 3). The worm is arranged vertically in a detachable housing (fig. 22) and is carried in bearings both above and below. The lower end of its housing is located in a cap inserted in the under side of the oil base. The worm shaft engages with the starter spindle by a coupling, of universal type. The worm wheel (fig. 23) encloses a freewheel

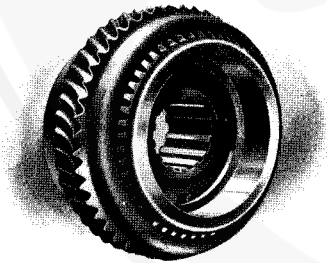


Fig. 23. Layshaft Worm Wheel and Free Wheel Clutch.

DETAIL DESCRIPTION.

clutch of the roller type mounted on the layshaft. This form of starting gear is free from shock and gives a remarkably smooth and comparatively silent action. A detail description of the starter and dynamo, together with their appurtenances, are subject of a separate booklet, which also deals with the adjustment and maintenance of same.

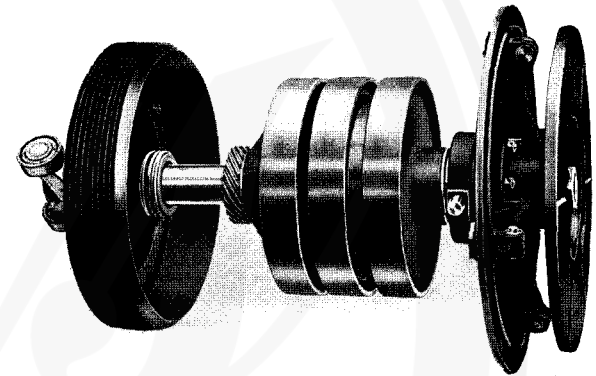


Fig. 24. Assembled Gears and Direct Drive Clutch Plate.

Gear Box. The Gear Box contains the three epicyclic trains of gear, the epicyclic clutches, and the main or direct drive clutch. The latter consists of a single steel plate (figs. 3 and 24) mounted on a splined head of the transmission shaft and in sliding connection with same; it is enclosed between two fibre faced discs, one of which is rigidly attached to the engine flywheel and the other to a movable disc which slides on keys carried in the flywheel rim. Normally, the clutch is disengaged, and engagement is effected by means of a forked lever acting on a ball thrust bearing which in turn acts on plungers passing through the flywheel cover disc (fig. 3). Provision is made for adjustment

DETAIL DESCRIPTION.

of the actuation in event of the clutch disc wearing. (See Maintenance—Running Adjustment Section).

The Epicyclic Gears (figs. 3, 24, and 25) consist of the 1st speed or Low Gear, the 2nd speed or Compound Gear (being a train of gears whose function is to increase the speed of the low gear train), and the Reverse. It is considered unnecessary to describe in detail the action of the Epicyclic Gears here, as they are identical in principle with the gears used in the earliest type of Lanchester Cars and are fully described in a separate booklet.

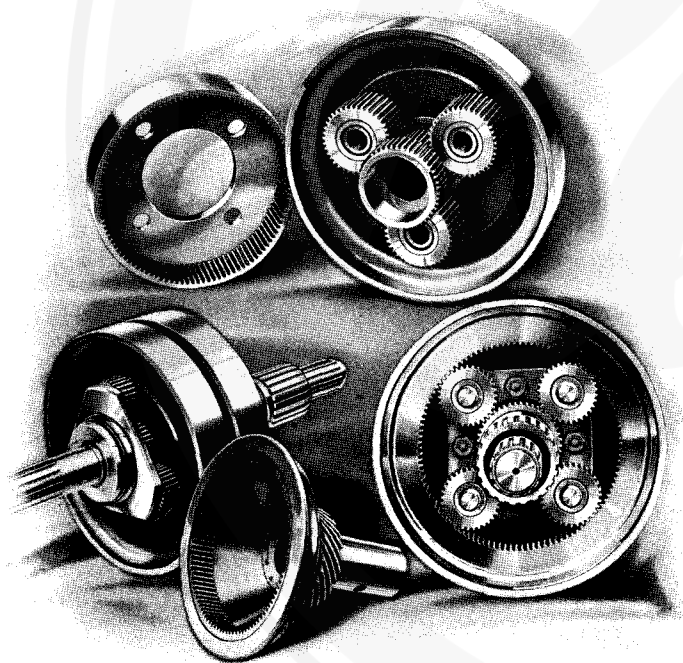


Fig. 25. Epicyclic Change Speed Gears.

DETAIL DESCRIPTION.

All the gears are of hardened steel and the central elements or "Sun" pinions and the "Planet" pinions are carried on hard steel roller bearings. Wear is negligible and the gears are practically indestructible. The gear clutches consist of hardened steel drums, operated on by hardened steel brake blocks, and wear is thereby reduced to a minimum. Adjustment of the clutches, although rarely necessary, is an exceedingly simple operation. (See Maintenance—Running Adjustment Section.)

The Clutches (fig. 26) are actuated by tumbler levers which engage with the selector bars and are

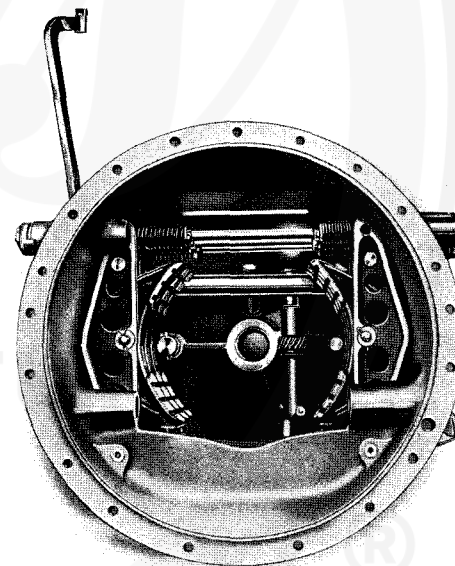


Fig. 26. Interior of Gear Box.

DETAIL DESCRIPTION.

operated by the selector cams (fig. 27), a robust spring controlled by the clutch pedal supplying the necessary pressure to effect the clutch engagement.

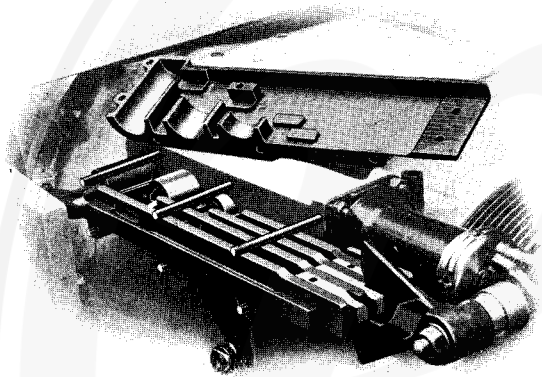


Fig. 27. Gear Selector Bars.

The whole mechanism within the gear box is lubricated by forced feed system; a gear pump (fig. 28) of similar design to that used in the engine, supplies oil at high pressure to all bearings. The oil is drawn from a sump (fig. 3) containing about one gallon and passes through a fine copper gauze filter before entering the oil pump. Oil pressure is regulated by a relief valve (figs. 1 and 3) which is situated in the rear end of the gear box and is accessible from above by removing the inspection cover. The oil pump is driven by skew gears and may be removed if desired without loss of oil from the gear box.

At the rear end of the gear box (figs. 3 and 29) is the Foot Brake, which is of the internal expanding type, the drum being mounted on the transmission

DETAIL DESCRIPTION.



Fig. 28. Gear Box Oil Pump.

shaft and the expanding segments on the gear box. The segments are actuated by bevel quadrants within the gear box, one of which is connected to the brake pedal and the other to the actuating cam which expands the segments. Provision for adjustment is made by varying the length of the brake pedal link and also by the position of intermeshing the bevel quadrants. For replacing the brake segment slippers the rim of the brake drum is made demountable and provision is made for the quick detachment of the segments. (See Maintenance—Running Adjustment Section).

At the tail end of the transmission shaft is the Universal joint of the cardan shaft (fig. 3) which is of the type known as a "Hooks" joint, consisting of two forks carrying at their extremities ball bearings, the axes of each pair being at right-angles to the other. The ball bearings are mounted in a cage having four recesses

DETAIL DESCRIPTION.

formed for their reception; covers are provided on the outer apertures of the recesses for the retention of oil. The forks are attached by splines, the one to the transmission shaft and the other to the forward end of the cardan shaft.

The Cardan Shaft (fig. 30) is tubular and terminates at the rear end with a telescopic coupling connecting it to the splined head of the worm shaft. The cardan shaft is enclosed within the torque tube,

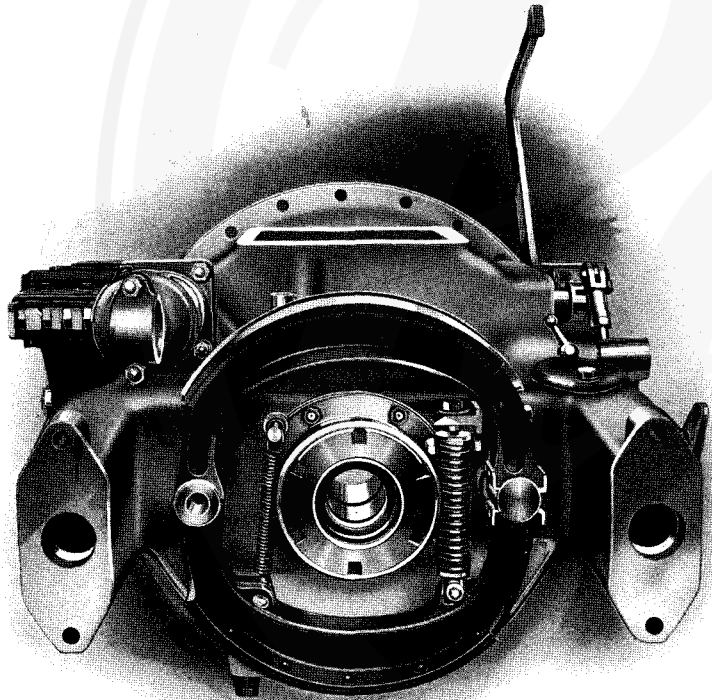


Fig. 29. Gear Box Brake.

DETAIL DESCRIPTION.



Fig. 30. Cardan Shaft.

which carries at the front end a spherical joint housed within semi-spherical cups, forming a socket secured to a transverse member of the chassis frame (fig. 31), which takes the thrust due to driving and braking. The rear end is bolted to the worm gear box and forms an oil-tight joint with same. Lubrication of the cardan shaft bearing and torque tube ball joint is provided for

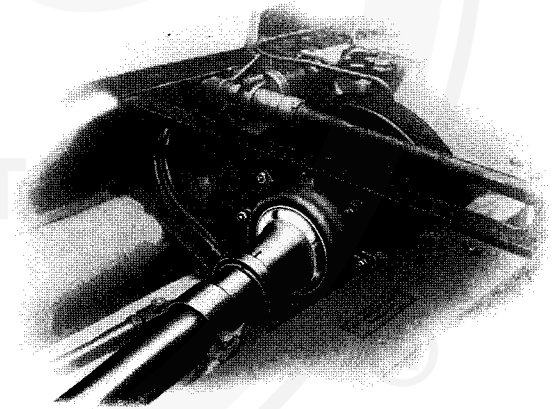


Fig. 31.

DETAIL DESCRIPTION.

by leakage from the gear box and also from the rear axle casing; the leakage from the latter occurring when the Car is travelling down hill is restored when travelling up hill or on the level, by means of a screw thread formed on the exterior of the cardan shaft telescopic joint.

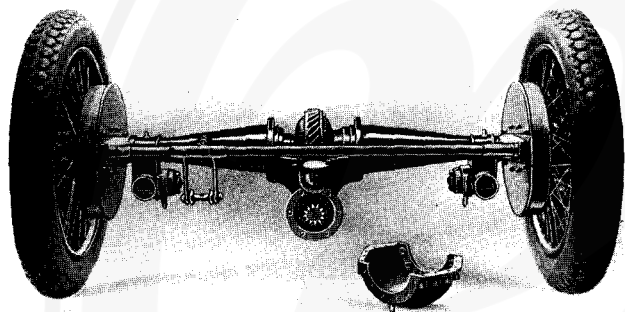


Fig. 32. Rear Axle.

Rear Axle. (Fig. 32). The Axle Casing consists of three components, the centre containing the worm gear and differential, and the outer pair consisting of the axle casing proper and carrying the suspension brackets, the rear wheel bearings, and the brake brackets and brake actuation mechanism. Diagonal ties are provided from the suspension brackets to the neck of the torque tube, whose function is to take accidental loads due to "potholes" and other irregularities tending to displace the axle in relation to the torque tube.

The Rear Wheel Hubs are each mounted on the extremities of the axle casing, the bearings being a hard steel roller bearing and a ball bearing; the latter takes combined load and load thrust.

The Axles (fig. 33) are threaded through the hubs from outside and engage with the differential gear

DETAIL DESCRIPTION.

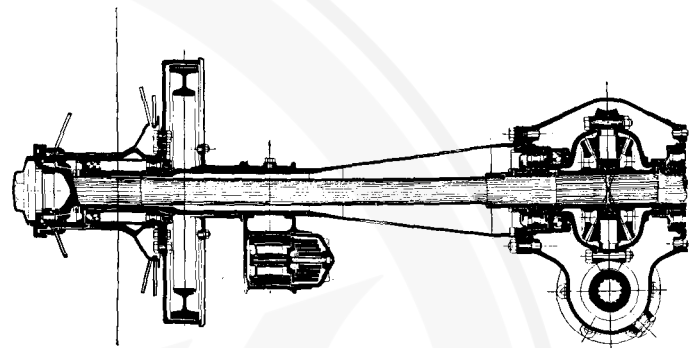


Fig. 33. Section Rear Axle.

wheels by means of splined ends, the outer end engaging with the hubs through the medium of splines and a cone joint, thereby eliminating a source of knock, and preventing the leakage of oil from the rear axle casing to the hub caps.

The well-known Lanchester high efficiency worm gear is employed (fig. 34) as used in the earliest Lanchester Cars. The worm is "underhung," i.e., beneath the worm wheel, and is carried on heavy hard

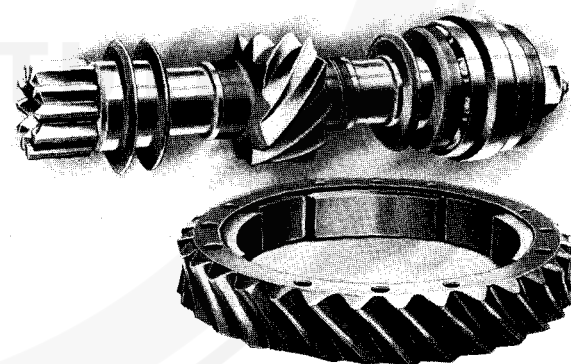


Fig. 34. Worm Shaft and Worm Wheel.

DETAIL DESCRIPTION.

steel roller bearings combined with a double ball thrust bearing of massive proportions.

The Worm Wheel (figs. 32 and 34) is of special alloy phosphor bronze and is bolted to drop forged steel differential gear covers, mounted on roller journal bearings, a single ball thrust bearing being provided on one side, arranged to take thrust loads alternately in either direction. Enclosed within the worm wheel is the differential gear, consisting of a pair of bevel wheels of exceptionally large diameter, and four bevel pinions mounted on the pinion star, the ends of which engage with steel driving blocks contained within the worm wheel. The bevel wheels are splined in their bores for the reception of the axle ends.

Lubrication of the worm gear and rear axles is by oil bath, the worm and a portion of the worm wheel being completely immersed in oil.



Fig. 35. Front Axle.

Front Axle. (Fig. 35). The Front Axle consists of an "I" section drop forging deviating but little in form from the orthodox. By employing underhung front springs, however, we are able to utilise a front axle almost straight, which gives exceptional clearance in the centre. The stub axles are drop forged and incorporated with them are the upper and lower journal bearings of the swivel head. The swivel pins are tapered, fitting in tapered holes passing vertically through the axle heads.

DETAIL DESCRIPTION.

The steering lever and steering coupling levers are secured to the swivel heads by accurately fitting spigots and by two dowel fitting bolts to each lever. For the steering lever special locking is provided in the form of nuts, locknuts, and double locking plates; ordinary methods of locking being considered inadequate for this important detail.

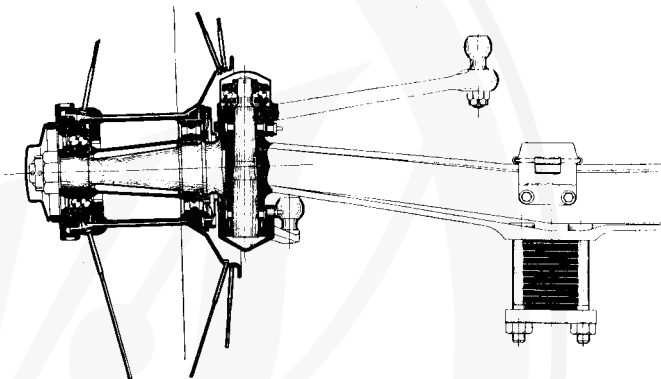


Fig. 36. Section Front Hubs.

The Front Hubs (fig. 36) are each mounted on two bearings, the inner one being a hard steel roller bearing and the outer one (which takes combined journal and thrust loads) being a ball bearing. It should be noted that the inner bearing lies almost in the plane of the tyre tread and therefore takes the greater portion of the journal load; the outer bearing being comparatively lightly loaded has ample capacity to carry all thrust loads to which it is subjected, in addition to its normal duty.

The steering links and coupling link are tubular, their joints being of the ball and socket type, the sockets being embodied in the link ends, and the balls (which are case-hardened) have taper shanks mounted in taper holes in the steering levers. The tubular formation of

DETAIL DESCRIPTION.

the links provides reservoirs for oil for the lubrication of the ball and socket joints.

Steering Gear. The steering column (fig. 37) is secured to the chassis frame at the lower end by means of a pivot bolt and is supported at the dashboard by an adjustable plinth having a spherical joint which is self aligning and permits the column to be adjusted vertically.

The steering shaft consists of a steel tube having an enlarged lower end on which are cut right and left-hand threads, engaging with two half sleeves, the one of which has a portion of thread right-hand and the other left, corresponding with the threads on the shaft. The lower ends of the sleeves are formed with hardened surfaces to bear on two hard steel rollers mounted in sockets provided in the rocking shaft (fig. 38). The trunnions of the rocking shaft are carried on hard steel roller bearings mounted 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 (seen in fig. 37) a ball thrust bearing is provided, which can be adjusted from outside to

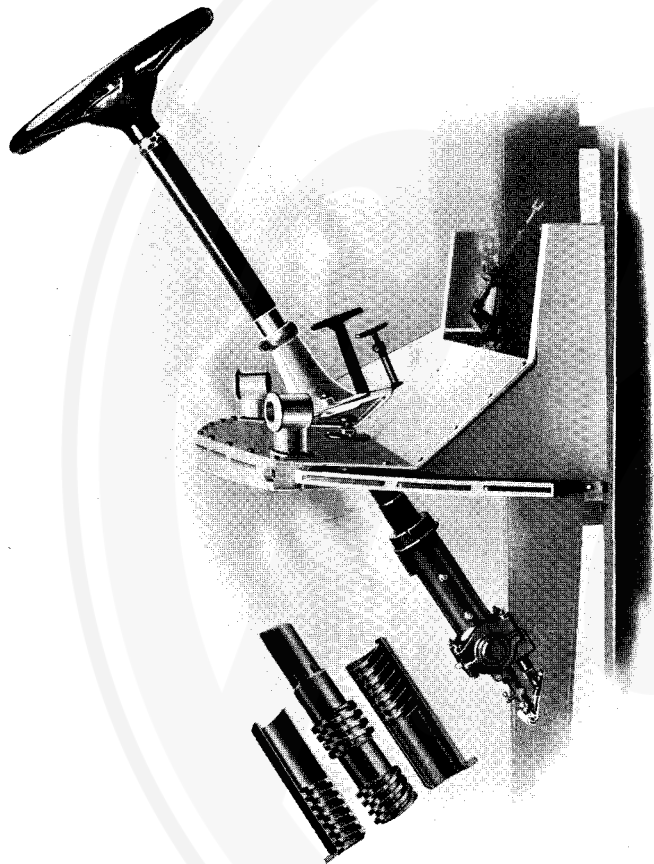


Fig. 37. Steering Gear Showing Half Sleeves.

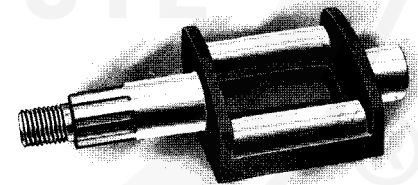


Fig. 38. Steering Rocking Shaft.

DETAIL DESCRIPTION.

eliminate slogger. 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 a bronze bearing. The wheel is secured to the shaft by combined splines and cone joint.

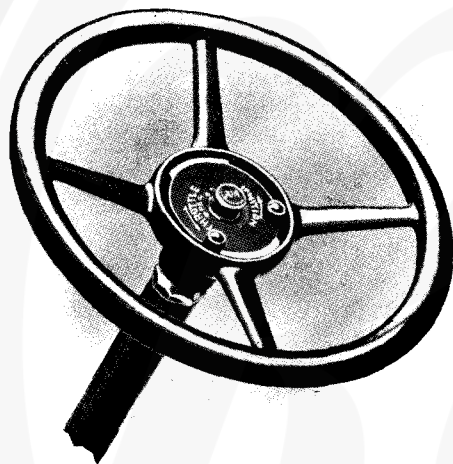


Fig. 39. Steering Wheel Showing Manette Dial.

The Manette Tubes pass through the centre of the steering shaft; the outside one being clamped in the steering base carries the manette dial bracket (fig. 39); to the inner tubes are attached the throttle manette, the ignition manette, and the carburettor control, at their upper end, and at the lower end is the throttle lever, the ignition lever, and the carburettor control mechanism. The levers are provided with ball ends, and the links connecting them to their respective destinations are provided with quick detachment sockets of special design (fig. 40).

DETAIL DESCRIPTION.



Fig. 40. Manette Levers Ball Ends.

The Chassis (fig. 41), as already stated, is of more or less orthodox appearance, but possesses several features worthy of remark. The chassis members are exceptionally deep and are also of exceptional width, giving considerable lateral stiffness. The frame is provided with a large tubular transverse member, which renders it torsionally stiff and relieves the engine crankcase of torsional stresses, which disturb the alignment of the crankshaft bearings. The front portion of the chassis frame is of tubular formation and is also exceptionally stiff. The rigidity imparted by these features enables us to effect a considerable saving of weight in the construction of bodywork.

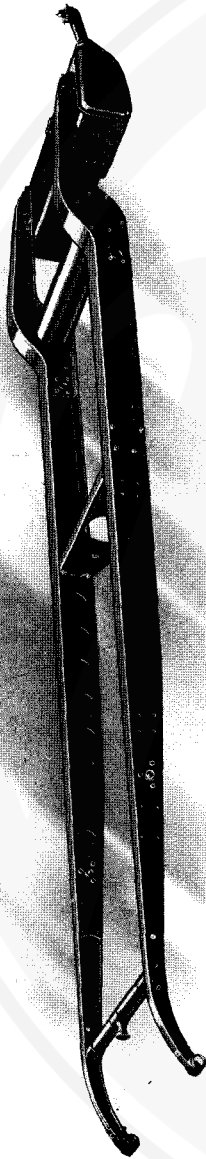


Fig. 41. Chassis.

Suspension. The Rear Suspension (fig. 42) is of the Lanchester cantilever design. A range of five types of springs are standardised to suit different weights of bodywork, and provision is made for approximately $1\frac{1}{2}$ -inch of adjustment vertically. The springs are pivoted at their centre on bearings having a floating phosphor bronze bush. Oil is employed as a lubricant and the

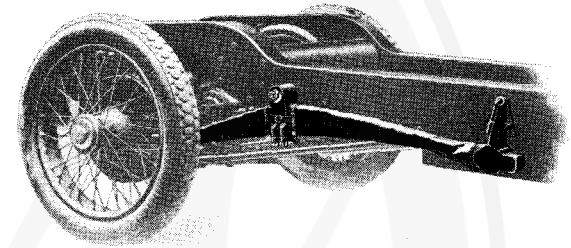


Fig. 42. Rear Cantilever Suspension.

pin on which the bearing is mounted is of large diameter and hollow, forming an oil reservoir. In place of the usual spring shackles the ends of the springs are carried in phosphor bronze trunnions (fig. 43) which are provided with a rectangular aperture passing diametrically through them for the reception of the spring extremities. Recesses are formed within the slotted portion of the trunnions to contain two pairs of rollers, which closely guide the spring leaves passing between them. 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 lubricant employed being oil.

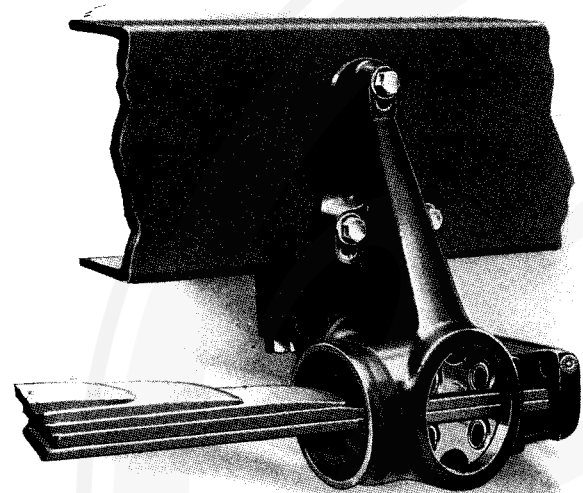


Fig. 43. Rear Suspension Front Anchorage.

The Front Suspension (fig. 44) 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

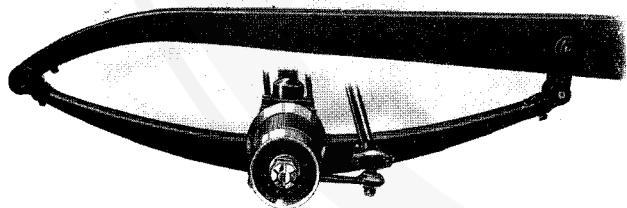


Fig. 44. Front Suspension.

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 solid forged ends of the master leaf, the bearing being a phosphor bronze floating bush (fig. 45). 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 (fig. 45). Three marks of front springs are standardised, to suit variations in load due to type of body and equipment.

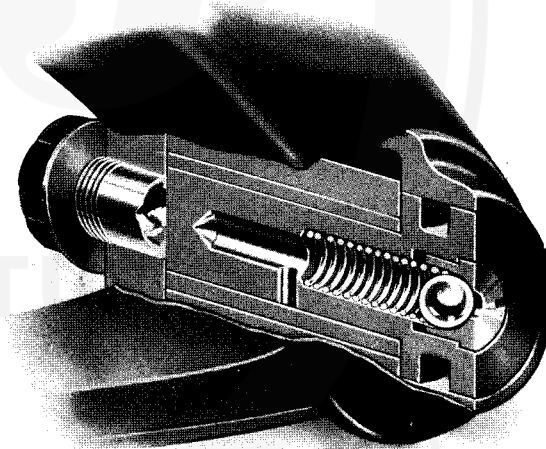
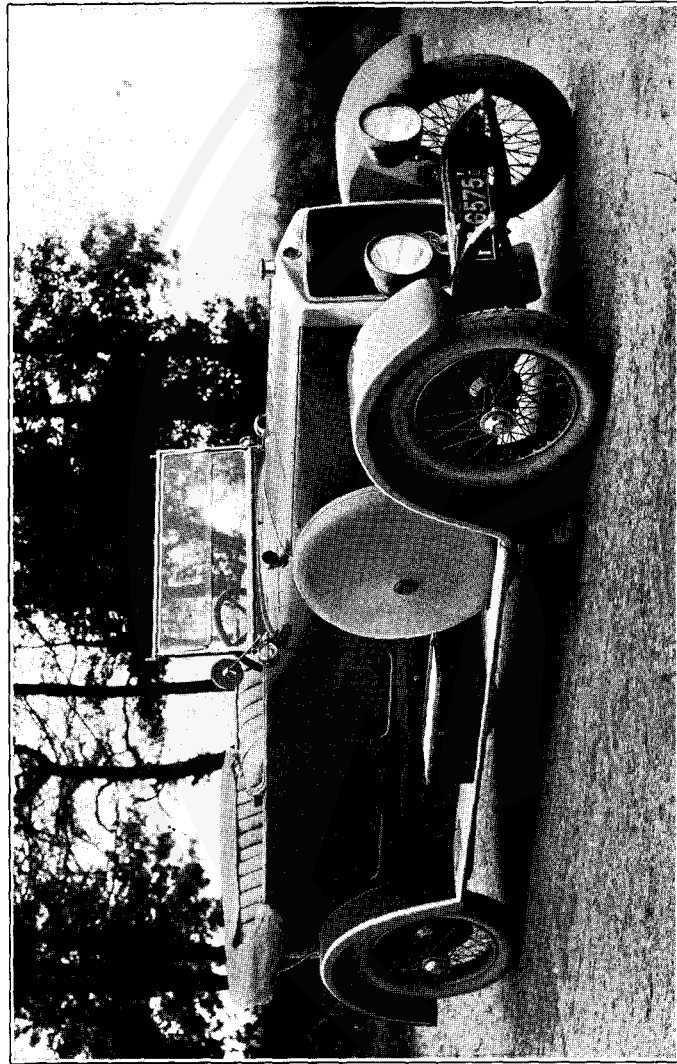


Fig. 45. Front Spring End showing Ball Valve Oil Chamber.



40-h.p. 6-cylinder 5 seat Lanchester Touring Car.

Starting and Running Instructions.

FOREWORD.

THE following brief description 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 placed on the instrument board immediately to the left of the steering column. It is provided with contacts for magneto and for battery ignition. Current for the battery ignition is supplied by the starting accumulators, which are located under the seat board on the driver's side.

The two ignitions cannot be used simultaneously, there being no advantage in power in arranging them otherwise.

The battery ignition requires 6 volts only, and ignition cables are therefore taken from one half of the 12-volt accumulators.

The positive lead is taken through a resistance box fixed on the rear end of the accumulator box. The purpose of which is; firstly, that in event of a short circuit occurring on any part of the lighting system, the discharge will be limited and will blow the fuse which is in the resistance box, and secondly, that in event of the ignition switch being left on battery contact the ignition coil will not burn out through excessive discharge.

STARTING & RUNNING INSTRUCTIONS.

The Ignition Timing is, as is usual, controlled by a manette lever mounted on the steering column, and the direction of advance is indicated on the manette dial in the centre of the steering wheel.

The Throttle and Air Controls are also mounted on the steering column, the throttle and ignition being similar in their arrangement. The air control (Smith Carburettor) is by a central knob having five positions of adjustment, three of which are indicated by the letters "S," "N," and "A," signifying "Starting," "Normal" and extra "Air." The intermediate positions may be used as required. For the S.U. Carburettor the knob controls the jet and is marked "Strong" and "Weak."

The Carburettor is arranged on the offside of the engine and is fed by an automatic vacuum controlled chamber. Priming taps are provided on the induction pipe leading into the valve ports, which may be used in event of the starting being obdurate, due to excessive cold, or other accidental cause.

Petrol is supplied to the carburettor by means of the Autovac system (which is fully described in Instruction Book supplied in Car equipment). This seldom needs attention, and is generally speaking more satisfactory than pressure systems.

The Electric Starter is operated by a switch of the push type, situated on the dashboard to the left of the clutch pedal and conveniently arranged for operation by the driver's left toe. The starter operates a free-wheel clutch mounted on the engine layshaft and the starting gears are always in mesh.

STARTING & RUNNING INSTRUCTIONS.

The Charging Dynamo is driven from the crankshaft by means of gears, and is therefore not liable to failure in action which is inherent to the popular method of belt drive. The dynamo is controlled by a charging switch, located centrally in the switchboard on the instrument board. Within the switchbox is also an automatic cut-out, which disconnects the dynamo at low speeds and thereby prevents the cells from discharging through the dynamo. Charging commences at about 13 miles per hour and at its initial charging speed should indicate 4 amps. At 20 miles per hour and over, the charging rate should be about 10 amps.

To continue charging after the accumulators are full is not liable to damage the cells, but causes gassing or boiling of the electrolyte, with consequent loss. If, on inspection, there is evidence that the electrolyte has been boiling over, the cells should be examined and if necessary re-filled. In all probability it will only be necessary to replenish with pure distilled water, but if the boiling has been excessive it may be necessary to replenish the loss of acid.

The density of the electrolyte should be tested by hydrometer.

Unless the garage is well heated it is always advisable in frosty weather to drain the radiator at night. It is a very simple precaution and far more effective than the use of so-called non-freezing compounds, but do not forget to re-fill the radiator when next the car is required, and if possible fill with hot water.

In cold weather it is very much kinder to the accumulators when first starting up, to hand crank the engine over slowly two or three revs. in order to

STARTING & RUNNING INSTRUCTIONS.

disturb the oil film which is liable to have become congealed. On the induction pipe priming taps are provided, which discharge into the inlet valve port, but these need only be used in the event of engine starting being obdurate.

INSTRUCTIONS.

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

See that the engine crankcase is filled with oil up to the requisite level (indicated by level gauge at rear end of crankcase).

(N.B.—Refer to Lubricating Instructions.)

See that there is sufficient petrol in tank.

See that main petrol tap under autovac is turned on.

Check the state of the accumulators by pressing in the headlight switch.

Starting on Coil Ignition. Retard ignition lever.

Starting on Magneto. Advance ignition lever about half-way.

Advance throttle lever three or four notches.

Turn air knob to position "S" (Smith Carburettor) or to "Strong" (S.U. Carburettor) for starting. Switch on ignition. Press down starting switch firmly and with decision, and release same immediately the engine is started.

(N.B.—No damage can be done by holding the starter switch down too long, but this action will cause wastage of the current from the storage battery.)

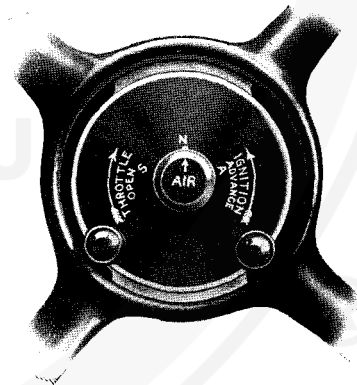
STARTING & RUNNING INSTRUCTIONS.

If the Car has been standing for long periods *before advancing the throttle lever and switching on*, allow the starter to give the engine two or three turns. This will make sure of replenishing the autovac petrol supply in case the vacuum tank is empty.

Having started; the ignition switch may be switched over to "M" (magneto ignition), the ignition lever advanced.

Engines fitted with Smith Carburettor.

After a few minutes' running rotate the air knob to "N" (normal running position). In hot climates, hot weather, or after the Car has been running some few miles and has got thoroughly warm, the air button may be turned to "A" (admission of extra air). It will be found advantageous, however, when running slowly, to return it to the normal position.

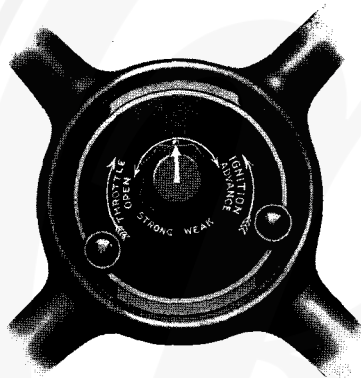


Manette Dial, Smith Carburettor.

STARTING & RUNNING INSTRUCTIONS.

Engines fitted with S.U. Carburettor.

Rotate jet control knob towards "weak" as far as possible consistent with maintaining good power. When slow running it may be found advantageous to return the knob towards "strong."



Manette Dial, S.U. Carburettor.

GEAR CHANGING.

With the Lanchester Epicyclic Change Speed Gear it is necessary to throw out the clutch to its full extent with every gear change, whether changing up or down. To engage the low gear, depress the clutch pedal to its full extent, place the change speed lever in the forward left-hand position. It is not necessary, or desirable to Force the gear change lever home into its gate. From low to second, depress the clutch pedal fully and pass the change speed gear lever from the left-hand forward slot, to the right-hand rearward slot. From second to top, again depress the clutch pedal fully and pass the gear lever from the right-hand rearward slot to the forward slot. For the reverse, draw the

STARTING & RUNNING INSTRUCTIONS.

change speed lever inwards and move it into the left-hand rearward slot. The gears being always in mesh and frictionally operated, no special skill or judgment is required to change gears, and no damage can be done by a faulty change.

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 between the clutch and brake pedals. The usual and most convenient method of speed control is to place the manette lever in the best slow running position and increase speed by the use of the accelerator pedal. The average running 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 climates, cold weather, or before the engine has got warmed up, it may be advantageous to advance the ignition more.

Before engaging the gear see that the hand brake is released. The hand brake lever is situated on the offside, *i.e.*, outside the change gear lever, and applies the brake when pulled backward — towards the driver. To release, move the lever knob inwards (to the left) in order to release it from the catch, and place it in its extreme forward position.

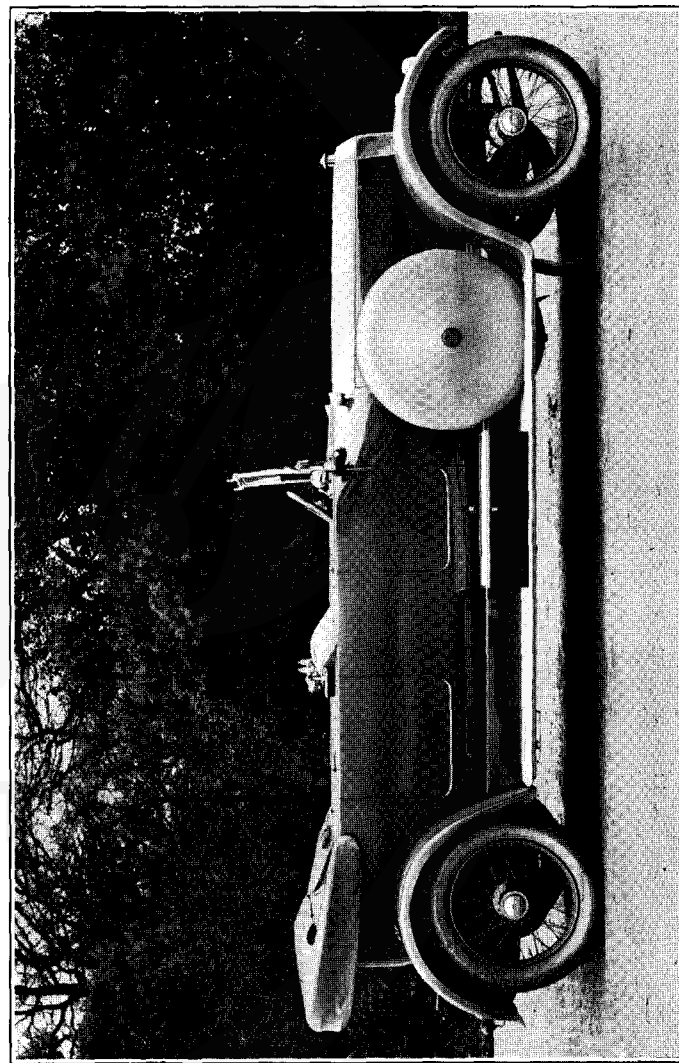
In general the magneto ignition is used during running, the battery ignition being used principally for very slow running and in event of the magneto failing. The battery ignition is, however, a thoroughly efficient and satisfactory substitute for the magneto and may be used continuously without injury.

STARTING & RUNNING INSTRUCTIONS.

ELECTRIC INSTALLATION.

When taking delivery of Car, and at periodic intervals, engage the headlight switch to see that the cells are fully charged.

The Car is delivered with two headlights, two side lamps and a tail lamp. The tail lamp may be fitted on the nearside or on the offside, according to regulations existing. It is connected both to the head lamp switch, and to the side lamp switch, and therefore will light up when either or both of these switches are engaged. The charging switch is placed centrally in the switchbox, the head and side lamp switches being disposed one on each side.



40-h.p. 6-cylinder 5 seat Lanchester Touring Car.

Maintenance.

INTRODUCTORY.

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 "Forty," 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 Lubrication of the Lanchester "Forty" is a point to which we have paid great attention, and whilst we do not advocate the entirely automatic system we have designed all the principal components to automatically control their own lubrication.

The following instructions clearly show the parts to be lubricated and indicates the correct lubricant to use. Spring shackles, steering joints and such like mechanism are on the vast majority of chassis lubricated with grease. In the Lanchester, oil lubrication is used throughout, excepting only, the Steering Column and Stub Axle pivots, Front Hubs and Fan Bearing.

A screw-down grease gun is supplied for lubrication of these parts, and for oil lubrication we supply with the tool equipment a special oiler (fig. 46) of the

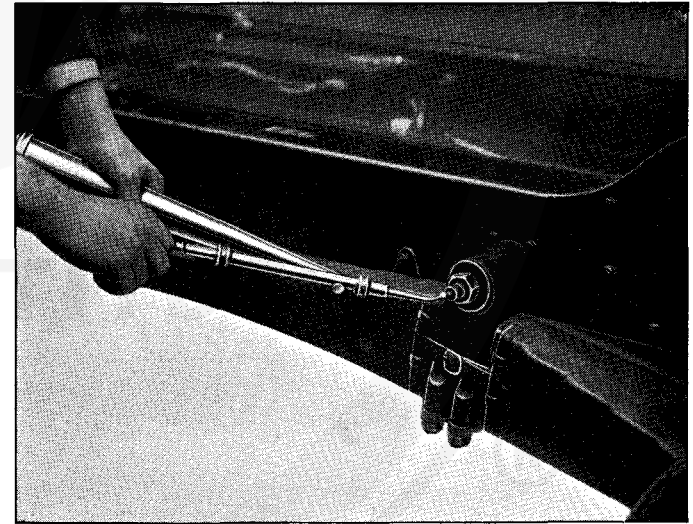


Fig. 46. Lubricating Rear Spring Pivot Pin.

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“Loco” type, in combination with which is a syringe ensuring that the oil is forced into the joint or bearing requiring lubrication.

It should be remembered that the Lanchester Gears have forced lubrication, by Gear Pump, similar to that widely used for Engine lubrication, it is, therefore, unnecessary to “drown” the gears in oil as one does with the ordinary sliding type of gear box.

Do not use more oil than is necessary to replenish up to the overflow. This point is important, as with the Lanchester type of gears an excess of oil may cause the gear clutches to slip.

INSTRUCTIONS FOR LUBRICATING.

The Engine carries about $\frac{1}{2}$ gallons of oil, and should be replenished every 250 to 400 miles. The oil filler “A” (figs. 47 and 49), is located in an accessible position on the offside front of the engine; and at the rear end of the engine (visible whilst filling) is a level gauge “B” (figs. 47 and 49). The engine should be filled until the top of the level gauge rod coincides with the notches cut in the gauge tube casing. The oil base is provided with a filter of large area, which is accessible from the front end of the engine, for periodic inspection, and may be withdrawn without losing oil. Generally speaking, it is sufficient to inspect the oil filter once or twice per annum. In event of it being desired to drain the crank case, a plug “V” (fig. 49) is provided beneath the oil level gauge. In event of over-filling, the oil level may be corrected by opening the oil level cock “T” (fig. 49).

The Gear Box. The filling hole of the gearbox “C” is on the driver’s side, and is rendered accessible by removal of the floor board. Adjacent to the filler is an

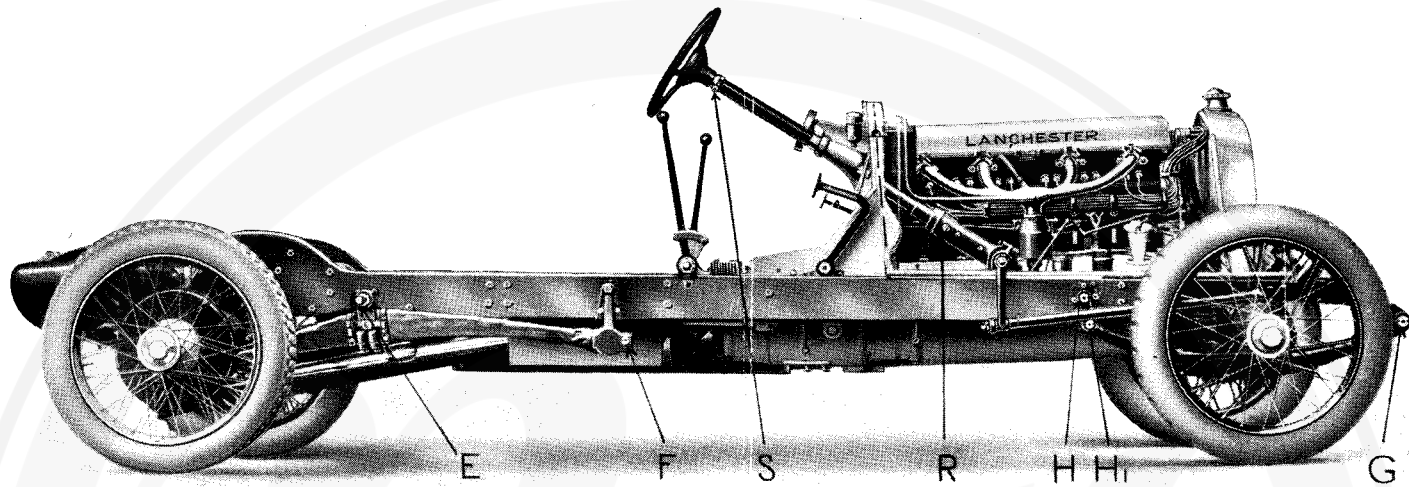


Fig. 48. Side Elevation of Chassis.

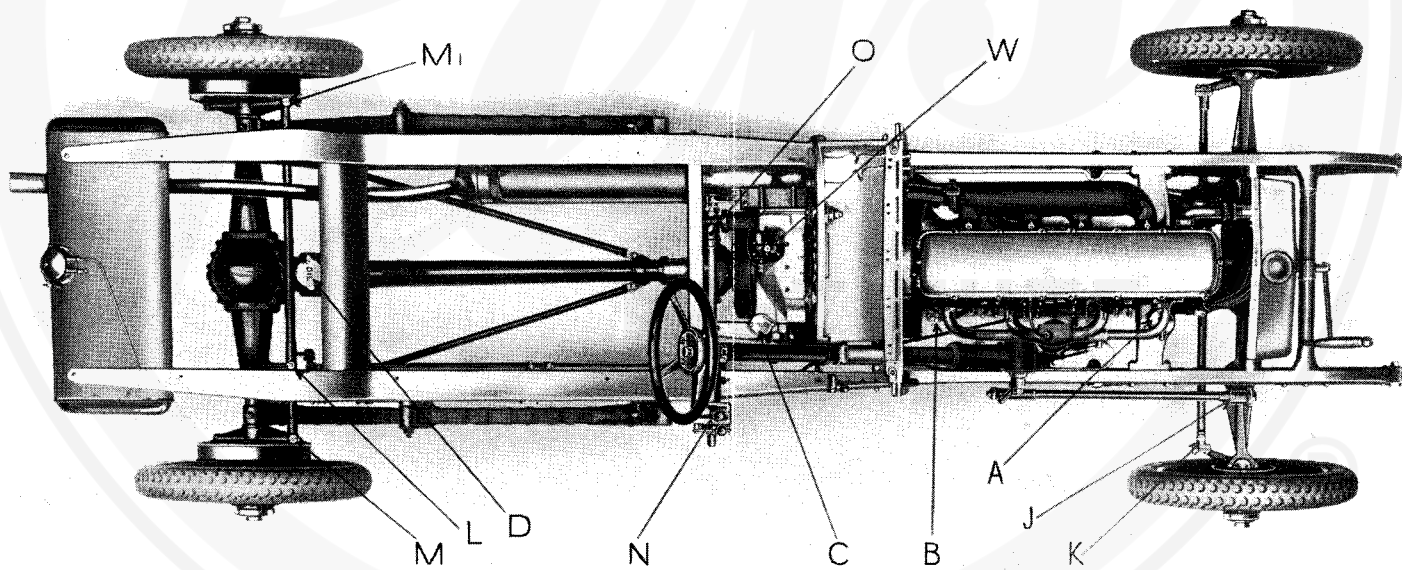


Fig. 47. Plan of Chassis.

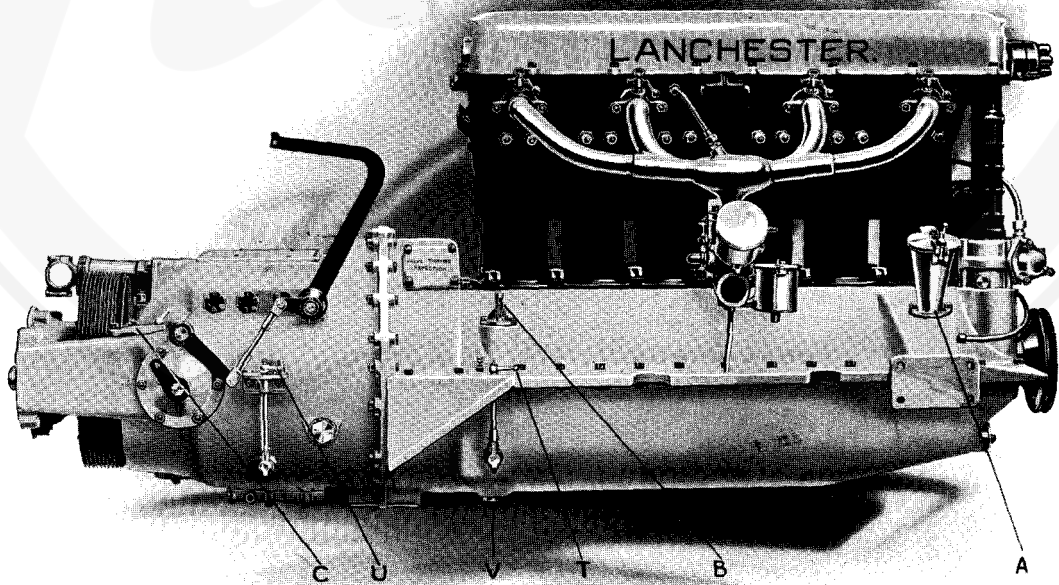


Fig. 49. Power Unit.

oil overflow cock "U" (fig. 49), which should be turned on when filling. When oil commences to run from the overflow, cease filling, close the overflow cock, and screw down the filler lid. The gear box should be filled about once in 500 miles.

For both engine and gear box use Lanchester "A" cylinder oil, or any reputable brand equivalent to same.

As long as the oil gauges on the instrument board operate, there is no need to refill with oil. The first indication that engine and gear box require re-filling will be that the oil pressure gauges cease to act when travelling down hill.

The Rear Axle is provided with a filler hole "D" (fig. 47), of ample proportions on the front of the worm gear box, accessible by removing the rear seat cushion and seat board. Re-fill once in 1,000 miles. A polished platen is provided in the base of the oil filler indicating the correct level for the oil. The worm gear box should be filled up until the oil is level with this platen. Leakage from the rear axle casing lubricates the tail end of the rear carriage springs, and also contributes to the lubrication of the cardan shaft joint and automatically lubricates the rear wheel bearings. The cardan shaft is provided with a ball bearing universal joint, which is concentric with the torque tube ball. This obtains its lubrication from leakage from the gear box, augmented by leakage from the back axle. When the Car is travelling down hill the leakage from the back axle flows into the torque tube ball, but the cardan shaft is provided with a screw thread which conveys the leakage back into the worm gear box when travelling on the level or up hill.

The oil employed for the back axle is Lanchester "B" oil, or any reputable brand equivalent.

With the exception of the front wheel hubs, the swivel heads, the steering box, and the steering column neck bearing, all lubrication is effected by means of the standard oil syringe, spring ball valves being provided in every lubrication hole.

The oil employed in the oil syringe is Lanchester "A" cylinder oil, and the following parts require periodic lubrication—

The rear spring centre pins. "E" (fig. 48).

The rear spring front end. "F" „

The front spring front end. "G" „

The front spring shackle pins (upper and lower). H.HI. (fig. 48).

The steering link (fig. 47), in which the oil hole "J" is adjacent to the front end joint.

The steering coupling link, which has an oil hole plug "K" adjacent to the offside ball joint.

All these parts should be lubricated about once a week when the Car is in use; in wet and muddy weather it is advisable to lubricate oftener.

The rear wheel brake shaft bracket is provided with an oil plug "L" and the brake shafts are also provided with spring ball lubricators "M" and "M1" and all link joints and lever bearings of the brake mechanism and pedal mechanism also require periodic lubrication.

Other parts requiring occasional lubrication are—

The gate change gear bearing "N" (fig. 47). In this case the nozzle of the oil syringe is inserted in the gate until it reaches the shaft and a small quantity of oil applied.

The selector shaft bearing "O" (fig. 47), local to the selector cams.

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Speedometer drive "W" (fig. 47).

Throttle and Ignition control levers, shafts, etc.

A small dose of oil on these parts about once a month is sufficient.

The front hubs, swivel heads, steering box, and steering column neck bearing, are lubricated with grease, and a special ball bearing grease is supplied for this purpose.

The lubrication of the front hubs is effected by removing the hub cap and screwing on a special hub cap having an adapter for the grease syringe (see fig. 50.) It is sufficient to inject about half a syringe full into each of the front hubs once in three months.

The swivel heads (fig. 51), are provided with grease plugs "P" and "P1" in the upper and lower bearings, and the syringe should be used on these bearings until the grease is seen to emerge from the joint above and below the axle head. Replace the plugs and see that they are tight after lubricating.

A plug is provided in the steering box "R" (fig. 48). It is sufficient to use about $\frac{1}{4}$ to $\frac{1}{2}$ a syringe full of grease in the steering box once in three months, and for the steering column neck bearing "S" (fig. 48), one or two turns of the grease syringe handle is ample.

Grease is also used for lubrication of the fan bearing, a plugged hole being provided in the fan bracket for the grease syringe.

Electric Horn.—Horns of the motor driven type, require occasional lubrication. Sewing machine or spindle oil is most suitable (motor oils being too viscous for this purpose) Only a very small quantity of oil should be applied.

N.B.—The preceding instructions are issued in duplicate with the equipment of every 40-h.p. Lanchester Car.

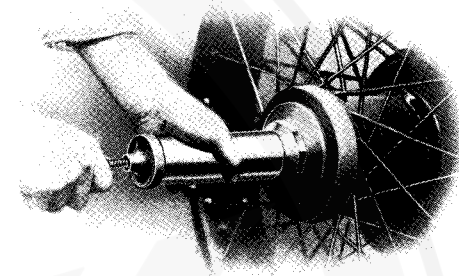


Fig. 50. Hub Greaser.

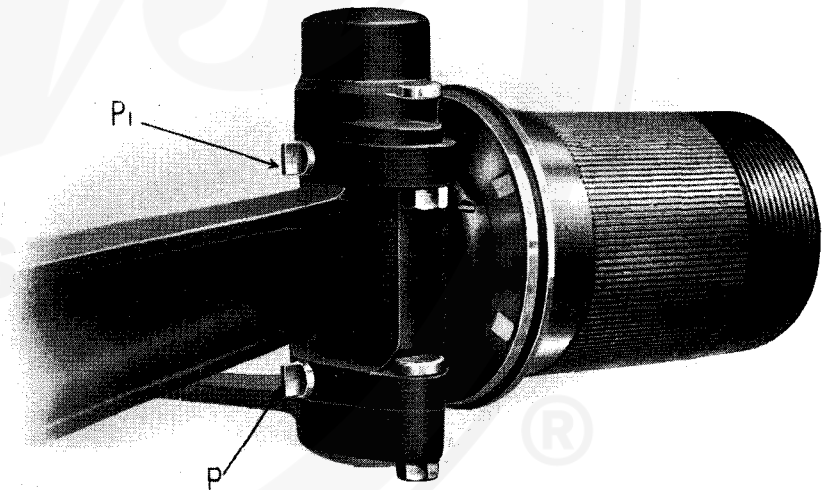


Fig. 51. Swivel Head.

Running Adjustments.

ADJUSTMENT OF VALVES.

Access to the valves for adjustment is obtained by removing the cam shaft cover.

First, disconnect the actuating link from the coil ignition distributor, slack out the set pin holding the distributor in place, and remove the distributor from the end of the cover; now remove the nuts holding the cover in place and lift it off. (Do not overlook the nut at the front end situated beneath the ignition distributor boss.)

To adjust the valve, place a lever — screwdriver or similar tool—(fig. 52) with the point under one of the

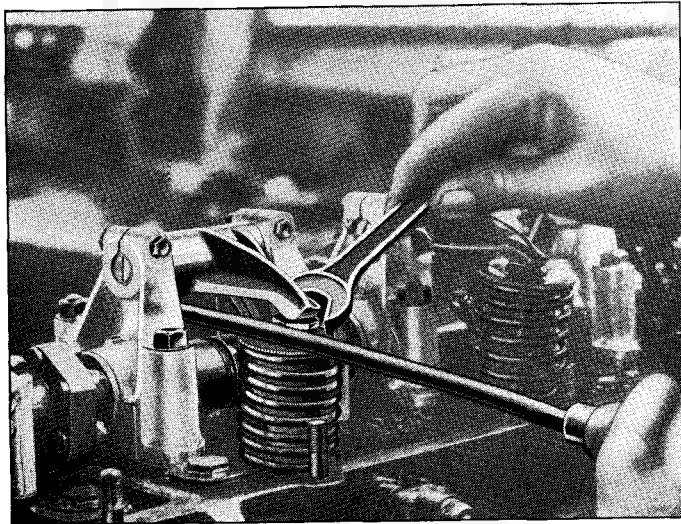


Fig. 52. Adjustment of Valve Tappet Clearances.

tappet lever bosses and the shank resting on the valve spring washer; the opposite side of the spring washer should be tapped smartly with a hammer or with the adjustment spanner, and the valve adjustment cap will immediately be dislodged from its socket. Depress the lever sufficiently to hold the valve spring and spring washer clear of the conical portion of the valve cap, and with the spanner provided screw the valve cap down or up as required. Releasing the spring automatically locks the adjustment. The valve clearance between the end of the tappet lever and the valve should be, on the feed side .006 in., and on the exhaust side .008 in. A standard feeler gauge should be kept for the purpose of checking these clearances. (We supply a special sheaf of "feeler" gauges but a piece of sheet metal 38 s.w.g. will serve as a feeler for the feed valve side, and 36 s.w.g. for the exhaust.)

It is advisable before adjusting the clearances to check over the existing clearances. In each check care should be taken to note that the cam rise is not adjacent, or approaching the tappet lever end. It is best to place the cam rise in a position approximately opposite to the lever end when checking.

When replacing the valve cover see that the facings are clean, and that all nuts are thoroughly tightened down, otherwise oil leakage will occur.

The battery ignition distributor coupling is provided with driving teeth of unequal size, so as to prevent the possibility of re-assembling it in the wrong position.

GRINDING-IN VALVES.

Access to the valves is obtained without disturbing the cylinders or employing detachable cylinder heads.

Preliminary Processes. Remove valve cover; remove tappet levers and temporarily replace the tappet lever pins in the brackets; remove feed valves complete

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with their housings; by method described for dislodging valve springs for adjusting the valve tappets dislodge the exhaust valve springs and remove the valve caps; the valves will then be free to drop into the cylinders and with the special tongs provided in the tool equipment can be removed through the feed valve port. Now rotate the crankshaft until the piston of the cylinder to be operated on is on or about its bottom dead centre, covering the piston with a piece of cotton or linen rag so as to intercept any abrasive material which may drop or run down the cylinder walls. Insert valve in its guide, this is effected by lifting it into positions with the tongs provided and passing it through the valve guide, engage the split stem (also provided in the tool outfit) in the hollow part of the valve stem; release the tongs and draw the valve up into its place. Holding the valve stem with the fingers, remove the split stem and secure the grinding-in tool, taking care to lock the sleeve nut by screwing the spindle tight against the end of the valve stem.

Grinding in. The valve is now in position for grinding and the grinding paste may be applied to the valve seat by lowering the valve as far as it will go and applying the paste with the finger or a brush through the feed valve port. During the process of grinding the valve should be rotated to and fro, lifting it off its seat at intervals whilst rotating.

After grinding in, thoroughly wipe the seat clear of abrasive material and also the inside of the cylinder with a mop or wad of cotton or linen rag.

In order to test the seat, thoroughly dry the valve, smoke the seat over a candle flame or oil flame with an even coating of soot, insert the valve in position, holding it lightly on to its seat rotate it to and fro about

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$\frac{1}{4}$ in., remove for inspection, and if the seating is thoroughly ground in the soot will be fairly evenly removed over the whole circumference of the valve seat.

When replacing the valve seats, tighten them down with a lever about 3 ft. long, and re-tighten after running the engine hot and allowing it to cool down again.

When re-assembling, compress the valve springs in a vice and enclose them in the two half muffs provided for the purpose.

After re-assembling, adjust the tappet clearances, testing with the slip gauges provided.

ADJUSTMENT OF GEARS.

The Gear selector cams (fig. 53) are provided

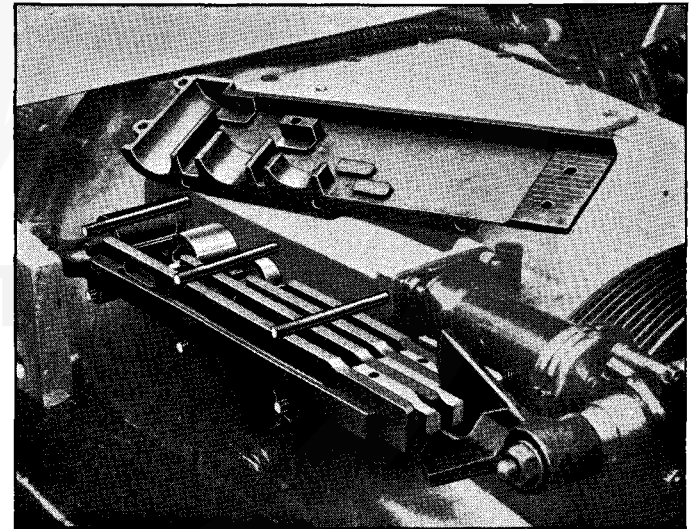


Fig. 53. Gear Selector Cams and Gear Selector Rods and Levers.

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with three teeth or "steps" whose function, by the movement forwards or rearwards of the gear change lever, is to take up all the early stages of wear of the friction clutches. When the gear change lever can be moved to the end of its gate without effort, it indicates that this adjustment has reached its limit, and that it is time to employ the main adjustment. The adjustment is effected by means of the three castle nuts (fig. 54) situated on the right hand (offside) of the gearbox, one castle nut effecting the adjustment of each gear. The front applies

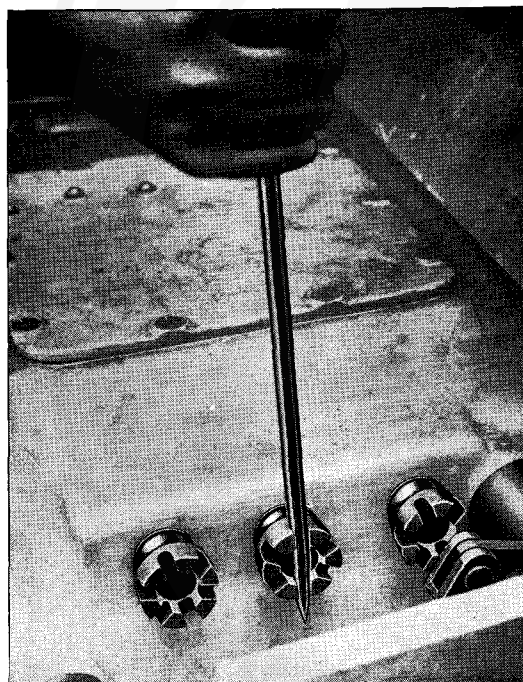


Fig. 54. Gear Adjustment Castle Nuts.
Right Hand—Reverse Gear. Central—Low Gear.
Left Hand—Compound or Second Gear.

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to the Reverse gear, the middle to Low gear, and the rear to the "Compound" or Second gear. These nuts can easily be turned with a screwdriver or similar tool, and to effect adjustment should be screwed up as far as the locking teeth will allow, and (when the stop is reached) turned back into the preceding notch; this will ensure a working clearance for the clutch.

ADJUSTMENT OF FOOT BRAKE.

The foot brake pedal is connected to the brake actuating lever by means of a link (fig. 55) the ends of which consist of knuckle joints screwed to the shank of the link. The upper knuckle joint is for adjusting the position of the pedal relative to the driver only. The lower knuckle joint is intended for

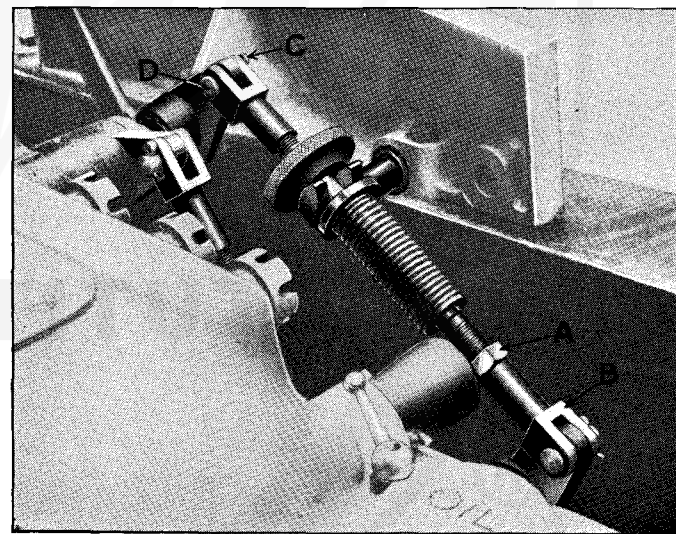


Fig. 55. Foot Brake Link with Spring Stop and Adjustment Collar.

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adjusting the brake shoes when wear has taken place. To make this adjustment, back off the lock nut A from the lower end knuckle joint B $\frac{1}{4}$ in. or $\frac{3}{8}$ in., or more if required, remove the cotter pin C and joint pin D from the Upper end knuckle, and lift the link out of the stop fork E (fig. 56). Holding the link at knurled collar, screw it into the lower end knuckle by the amount of thread that the lock nut has exposed, force the link into the stop fork again, and re-couple the top end. Replace split pin and lock the lower end nut. When the whole of the adjustment provided in the link has been taken by the above method, a further

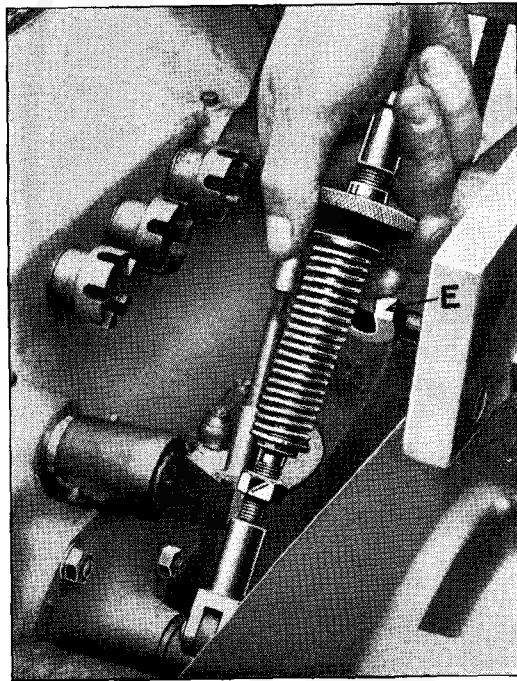


Fig. 56. Foot Brake Pedal being adjusted.

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adjustment can be obtained by detaching and re-meshing the bevel gear segment (to which is connected the actuation lever). The actuation lever and bevel segment is mounted in a bracket having a circular flange secured to the gearbox by five studs. Remove the nuts, withdraw the circular flange from the gearbox, and rotate the actuation lever one tooth contra clockwise (looking from the driver's side). This operation is made visible by opening the gearbox oil filler lid. Replace the disc and nuts, taking care to tighten them up evenly. Re-adjust the link to give the pedal about $1\frac{1}{2}$ in., but not more than 2 in. movement.

ADJUSTMENT OF REAR WHEEL BRAKES.

Provision is made for adjustment of the rear wheel brakes by varying the length of the brake link between the idle lever and the compensating bar of the brake actuation, (fig. 57). About $\frac{3}{4}$ in. adjustment is

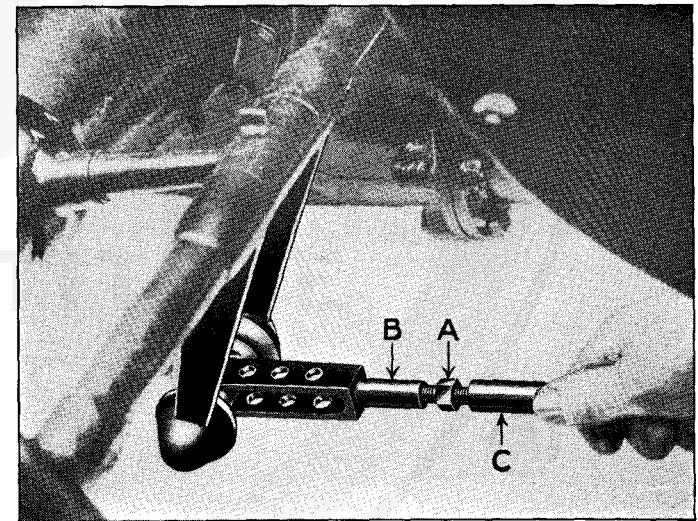


Fig. 57. Adjustment Fork of Hand Brake Lever.

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provided by screwing the shank of the link into the rear fork lug. This can be adjusted by slacking out the lock nut A against the fork lug B, detach the joint at the upper end of link C, and screw the link into the fork lug the necessary amount. In the event of this adjustment proving insufficient, the fork lug is provided with a series of holes; and the joint pin should be removed and re-engaged in the next hole nearer to the root of the fork; the link may then be adjusted to suitable length to give the requisite further life to the brake. The adjustment should be arranged so that the brake comes into action when the hand lever is pulled

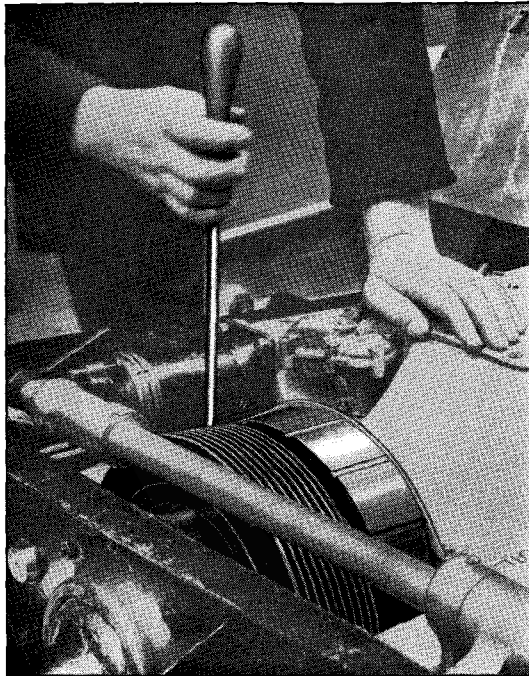


Fig. 58. Removing Gear Box Brake Shoe.

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one-third to half-way along its quadrant. In later type Cars this is superseded by a hand adjustment which is self-locking.

REPLACING SEGMENTS ON GEARBOX BRAKE BLOCKS.

The gearbox brake drum is carried on a large diameter flange, enabling the drum to be dismantled and slipped back on to the spherical joint housing. (Fig. 58.) Before dismantling it will be found convenient to detach the bearing cap from the change speed gear selector shaft, so as to move the shaft further back out of the way.) Having dismantled the drum, dislodge the brake shoe by using a lever between the brake shoe and the gearbox arm, force the shoe over towards the offside (fig. 59). It can then be

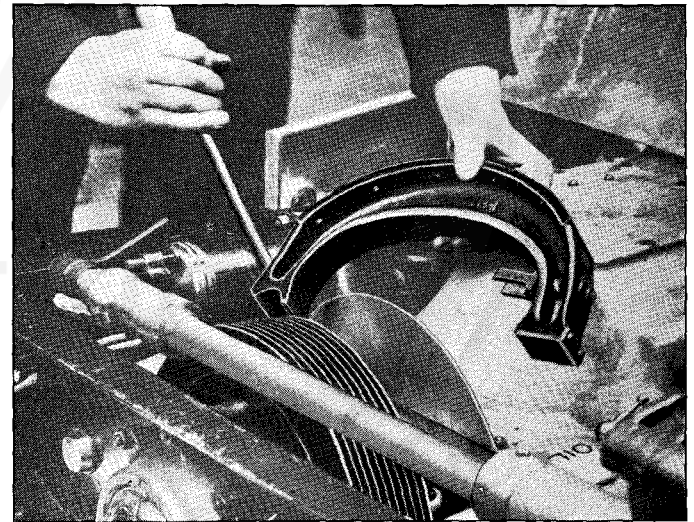


Fig. 59. Gear Box Brake Shoe Detached.

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either replaced with a new shoe or re-faced with new segments at will. After removing the upper brake shoe, the lower one is held in place by one spring on the nearside, and is easily dismantled by hand. In replacing, follow out the reverse of the above instructions, i.e., replace the lower shoe, and re-engage its spring; replace the upper shoe, placing it as far over as it will go to the offside, using the lever between the offside gearbox arm and the brake shoe, force the shoe over towards the nearside, when it will slip into place with a sharp snap. The drum can then be replaced.

ACCELERATOR PEDAL ADJUSTMENT.

The accelerator pedal is provided with means for varying its length to suit drivers of different height. The pedal (fig. 60) is provided with a stem which

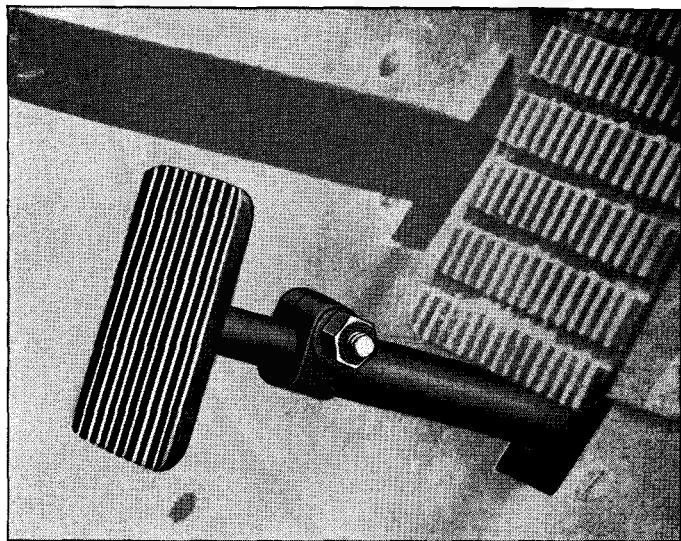


Fig. 60. Accelerator Pedal (Centre Pedal).

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telescopes into the pedal lever shank and is provided with notches into either of which the locking pin may be placed (fig. 61), tightening the locking pin clamps the stem.

ADJUSTMENT OF CLUTCH AND BRAKE PEDAL LINKS.

There is also provision for adjusting the clutch and brake pedals to suit the driver. (Fig. 62) shows the clutch and brake pedal adjustment links. To effect the adjustment to either pedal it is only necessary to remove the split cotter pin A, which secures the joint pin B in the top knuckle joint, take out the joint pin, screw the knuckle either down or up the shank of the link in order to bring the pedal nearer

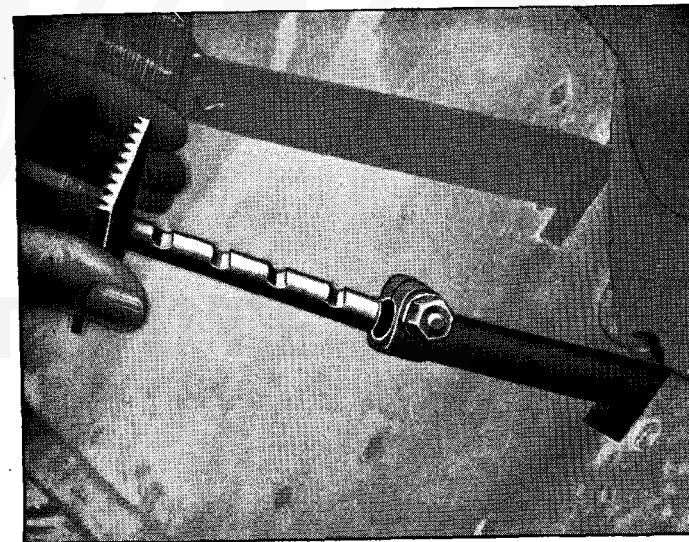


Fig. 61. Adjustment Notches on Accelerator Stem.

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to or further away from the driver. With this done secure the knuckle joint with joint pin and replace the split cotter.

ADJUSTMENT OF CLUTCH.

The single plate clutch of the Lanchester "Forty" rarely requires adjustment; indeed many of these Cars have been in service upwards of 20,000 miles and up to the present time do not require clutch adjustment.

In event of adjustment being necessary, remove

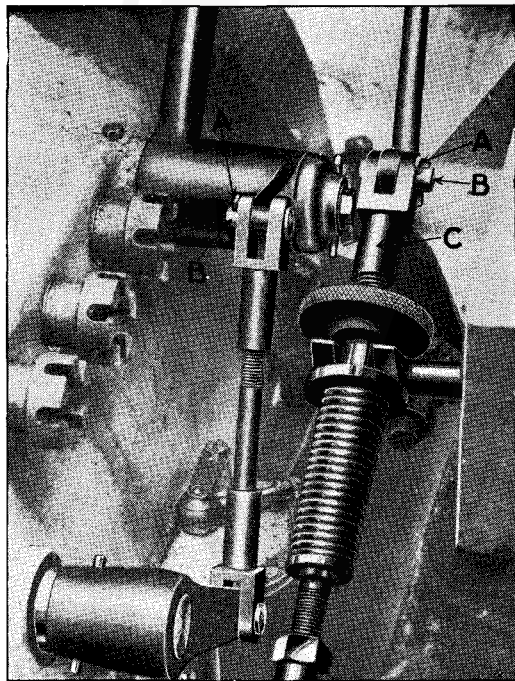


Fig. 62. Adjustment Links of Clutch and Brake Pedals.

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oil guard between gear box and exhaust box. Below the change speed gear push bars will be found the clutch actuating link. In order to set up the clutch it is necessary to lengthen the link A (fig. 63). This is effected by slacking off the lock nut at the upper end of link, detach the fork lug from the clutch lever at the lower end, unscrew the link from the stem, at the upper end two or three turns, re-engage the fork with the clutch lever, replace the joint pin and split pin locking same, and tighten the lock nut.

The correct adjustment is such that the change speed gear lever will easily enter the first notch when the clutch pedal is fully depressed but will scarcely or with difficulty enter the second notch.

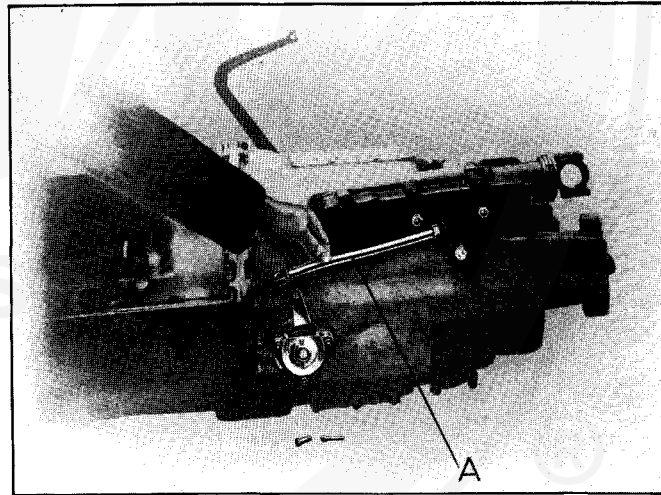


Fig. 63. Adjustment of Clutch.

MAINTENANCE.

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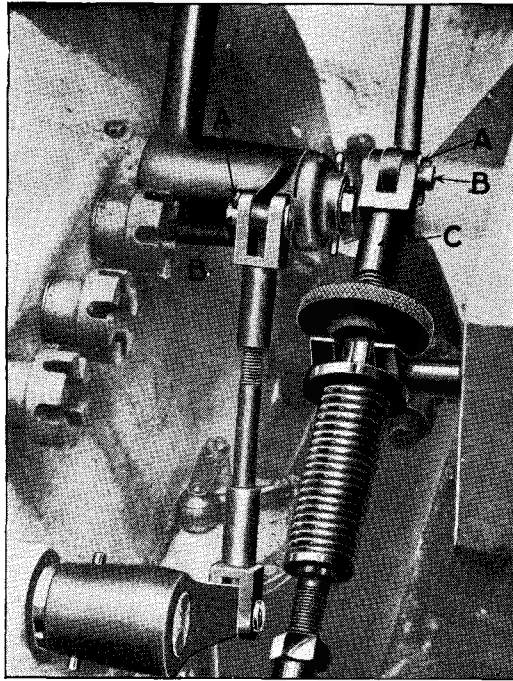


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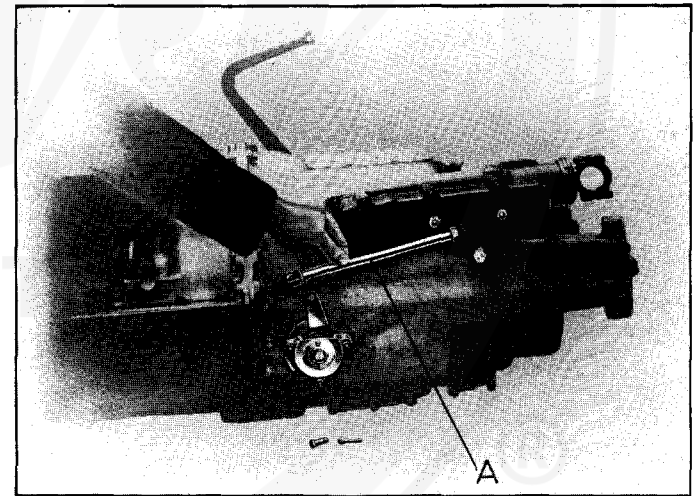


Fig. 63. Adjustment of Clutch.

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.

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 kept 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 into 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, 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 flattening 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 occasionally 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).

In the case of Touring Cars having a cape cart hood, the car should never be left standing in the garage with the hood folded, otherwise creases will develop, giving an unsightly appearance.

The hood should never be folded down whilst wet or even damp, but left erected until quite dry, and when folded, care should be taken to pull the material outwards from between the sticks and fold it over the top, folding the corners in neatly, and covering the whole with the hood envelope.

The hood should periodically be well brushed to remove the dust.

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 superfatted 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 the 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 not 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.

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. Spares and replacement parts are despatched wherever possible immediately on receipt of instructions.

Earlier Types of Lanchester Cars.

The earlier types of Lanchester Cars no longer manufactured or listed, are as follows:—

10, 12, 16 and 18 h.p. Two-cylinder.

20 and 25 h.p. Four-cylinder.

28 and 38 h.p. Six-cylinder.

These types, although obsolete from a manufacturing point of view have been produced in quantities on the interchangeable system, and we still manufacture and stock replacement parts.

Also in connection with these earlier models we have the following instructional literature and are pleased to forward copies on request.

10, 12, 16 and 18 h.p. Descriptive Manual.

10, 12, 16 and 18 h.p. Driving Manual.

10 and 12 h.p. Engineers Manual.

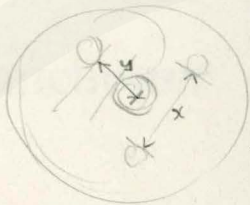
20 and 28 h.p. Engineers Manual.

20 and 28 h.p. Descriptive Manual.

25 and 38 h.p. Descriptive Manual.

Tolerances

Planet Wheel Spindles
distance y - $\frac{1}{2}$ than each way
also distance x the same



Magneto - Watford E06 G

Coil - Delco

Dynamo - Lucas E575, 12V 12A Cut-in @ 700 rpm G
Ratio 1.8 to 1 \therefore cut in 389 rpm of engine

Starter - Lucas A910 12V, 15 lb ft. 12 teeth G

Switchboard, Lucas CS12 or F25 in earlier models.

System - Double wired, with junction box (3-way) for lamps
and distribution box for horn, coil and interior lamps, etc.



40-h.p. 6-cylinder 5 seat Lanchester Touring Car.