ENGINEERS' MANUAL

20 & 28 HP

THE LANCHESTER
MOTOR CO., LTD.
SPARKBROOK, BIRMINGHAM
311 OXFORD ST., LONDON | KING ST. WEST, MANCHESTER

THE

LANCHESTER MOTOR CO.,

LTD.

ENGINEERS' MANUAL.

INDEX.

HUDSON & SON,
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BIRMINGHAM.

To Remove the Coupling Shaft.

Remove the two split Cap Keys *A A*, that lock the caps (*fig. 1*). Then unscrew and remove the caps.

Remove the two *taper split Cotters* which secure the *Coupling Shaft joint pin* in the coupling block. Now withdraw the exposed joint pin. Before withdrawing the Coupling Shaft from the driving pot (at the upper end of the shaft) remove the Grease Cover *E* (*fig. 7*) by removing the split pin and unscrewing the cap.

Now remove the Coupling Shaft.

N.B.—When replacing the Coupling Shaft see that the pins and joints are clean and well lubricated, and, after replacing, see that the Grease Cover is properly screwed into place, and that all split cotters are properly replaced and locked.

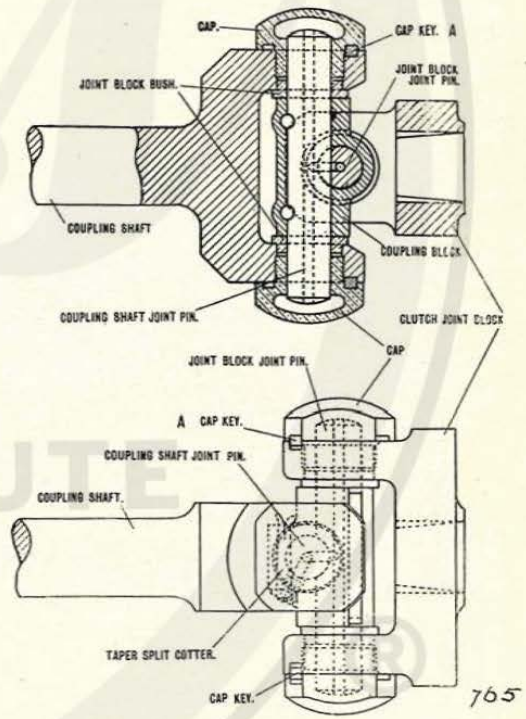

FIG. 1.

To Remove the Under Pan.

Remove the Nuts *A* (*fig. 2*) that attach the Spring Shields.

Now lower the Spring Shields, sliding them out of their grooves at their lower edges.

Remove the three Nuts *B*.

Remove the four Nuts (two on each side) attaching the Pan to the underside of the Chassis members.

Now spring the Front Screen out over the three Studs in the front of the Underpan. Remove the Nuts (two each side) which attach the Pan to the underside of the Chassis members, and press one side of the Pan inwards to disengage the attachment studs from the Chassis.

The Pan can now be lowered and withdrawn from its attachment on the other side. If it be necessary to detach the Front Screen, slack out the four Nuts *D*, and draw the plate forward out of its location. (It is not necessary to entirely remove the Nuts).

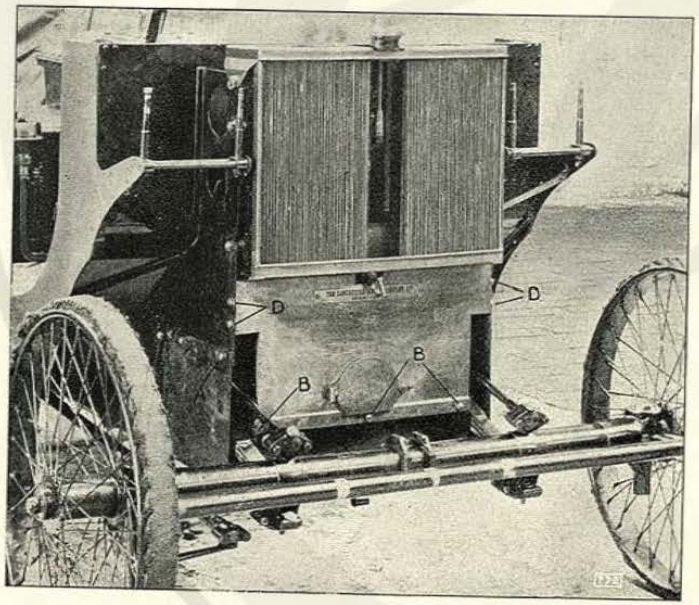

FIG. 2.

To Remove the Radiator.

Remove the two Brass Clips which attach the flexible connection on the upper and lower Circulation Pipes to the Radiator.

Slack out the three Nuts on each side of the Radiator which attach same to the Chassis. If necessary loosen the flexible Connection Pipes by inserting a screw-driver or thin blade between the Radiator Pipes and the Rubber. This may be performed from the front through the central gap in the Radiator. Now draw the Radiator forward (slightly lifting) out of its location.

N.B.—When replacing, it is advisable to clean the Pipes and smear a little indiarubber solution over them before entering them into the flexible connections.

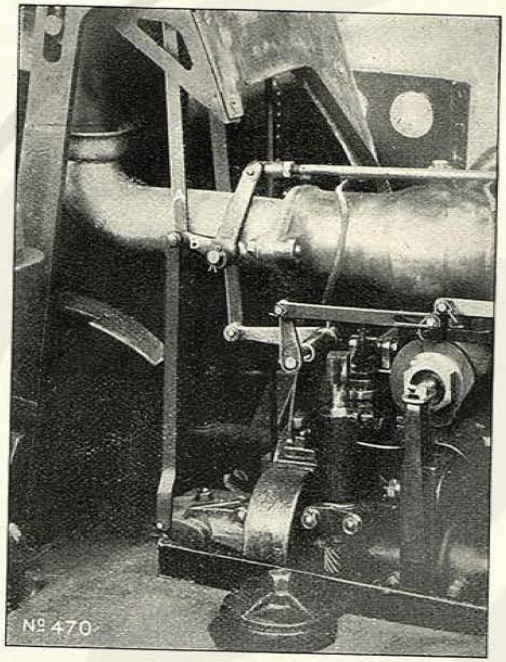

FIG. 3.

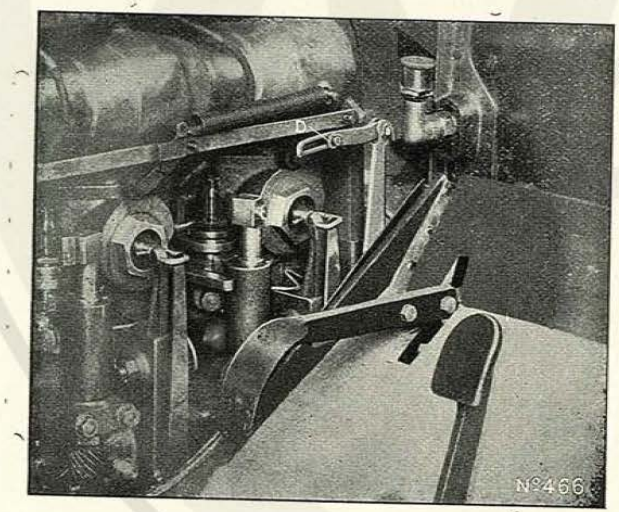

FIG. 4.

REMOVING MOTOR AND COUNTERSHAFT COMPLETE.

PRELIMINARY OPERATIONS.

Remove Dash.

Bonnet.
Floor Mats.
Floor Boards.
Seat Apron Panels and Bonnet Corner Panels.
Bonnet Channels.

Remove Coupling Shaft (*see* description, page 3).

Remove Under Pan end } (*see* description, page 4).
front screen }

Drain out water of Radiator and Engine; and

Remove Radiator (*see* description, page 5).

TO REMOVE VAPOUR REGULATOR PLUG, depress one end of the numbered quadrant, and withdraw it from its pins. Then the plug will be free to be lifted out.

Remove the Vapour Coupling Pipe.

Removing the Regulator Plug exposes the Vapour Coupling Pipe. This Pipe is composed of a telescopic portion, on which two rubber rings are mounted. These rings make joint by expansion, and are expanded by means of a central stud or wire and wing nut. Slack out the wing nut four or five times. and the coupling pipe may be withdrawn vertically.

Detach the Ignition operating link *A* from its Bell Crank Lever *B* (*fig. 3*).

Detach the Governor operating link A_1 at its lower extremity.

Detach the Throttle actuating link *C* (*fig. 4*).

Remove the Split Pin *D*, and spring the link sideways off the throttle pin.

TO DISCONNECT THE EXHAUST PIPE.—Withdraw the Pin *E* (*fig. 5*) from the Exhaust Pipe Joint. Disconnect the Clutch Box Oil Pipe *F* (*fig. 6*) at its union (found at its lower end).

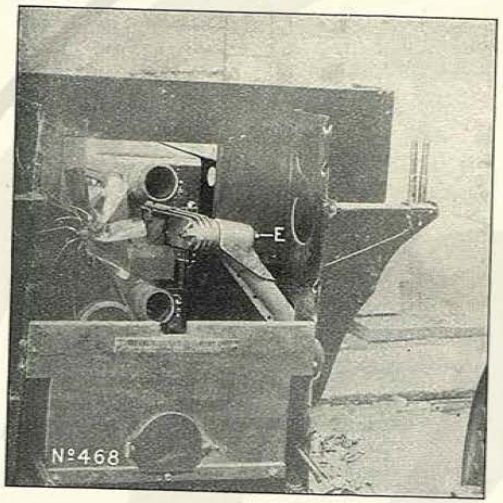

FIG. 5.

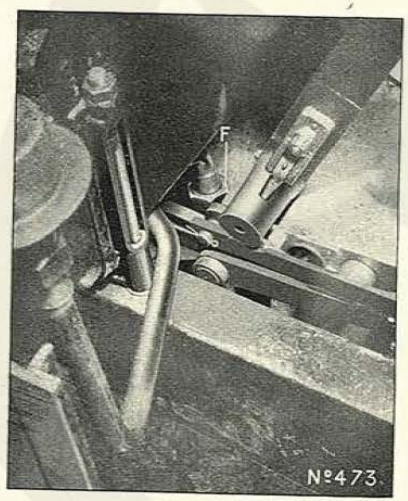

FIG. 6.

IF AN AUXILIARY OIL TANK IS FITTED—

Disconnect the Oil Pipe at its lower union against the Crank Pan.

Disconnect the Countershaft Tail Bearing Hanger.

Remove the two Split Pins *C* (*fig. 7*).

Unscrew the two Hanger Bolts *B*.

Remove the Hanger Clips *A* and Distance Sleeves *O*.

THE ACTUAL PROCESS of removing the Engine and Countershaft is now ready to be performed, and may be carried out in either of two methods, according to the convenience at hand

If a coach-house is equipped with a pit and a pair of pulley blocks, it will be found most convenient to attach two rope slings, one around the clutch box just behind the change gear box, and the other around the crank case, and, having made the slings fast, take the weight of the Motor on the pulley blocks, and remove the four Engine Bolts (having previously removed the Split Pins from their lower ends).

The Motor may now be lowered into the pit (preferably on to some wood blocks or suitable packing), and the Car then wheeled clear away.

If no pit or pulley blocks are available, place packing blocks under the Motor and Countershaft, to stand about 1in. clear of the underside ; then remove the Motor Bolts, slacking them out alternately so as to allow the Motor to come down evenly on its packings.

Now jack the Car at its front end, and withdraw the Motor from under it.

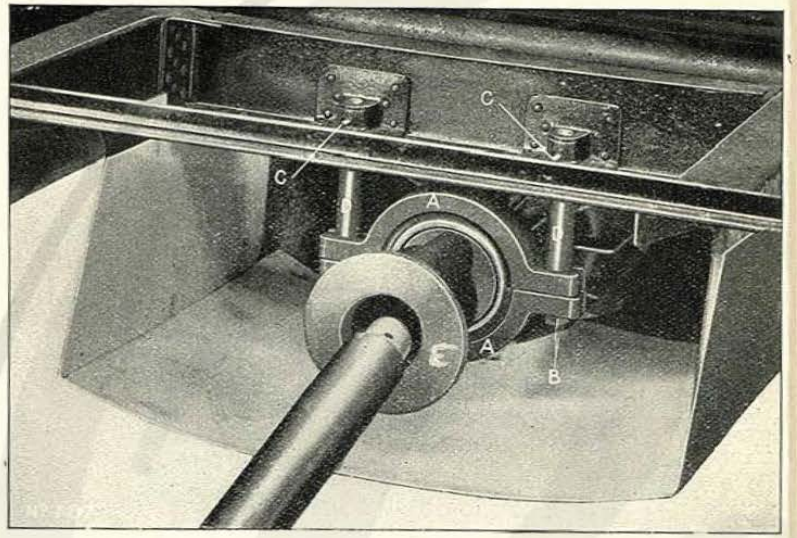

FIG. 7.

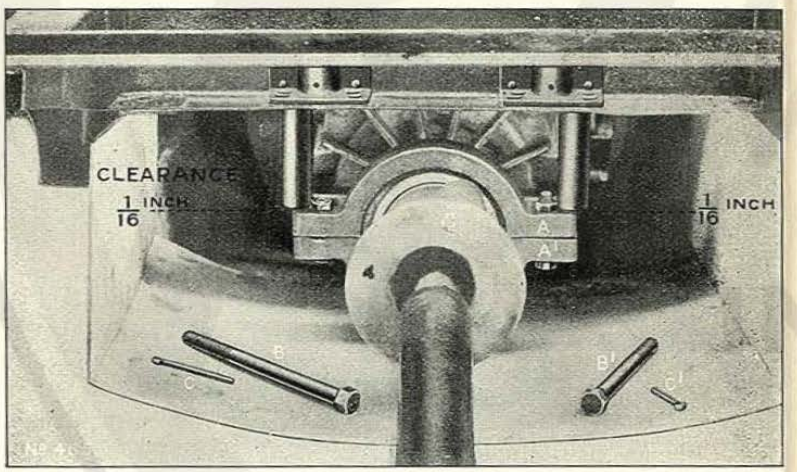

FIG. 8.

REMOVING MOTOR AND COUNTERSHAFT COMPLETE.

CONTINUED.

WHEN REPLACING THE MOTOR.

In order to ensure replacing the Engine and Countershaft in the Chassis truly and in perfect alignment, and free from accidental strains due to bending, the following hints may be of service :—

Having lifted the Motor into position and started the four Bolts, screw up the Bolts evenly, so as to avoid putting excessive strain on any of the four Brackets. In order to ascertain that the Bolts are screwed up the correct amount, place the Countershaft Hanger Clips in position temporarily bolted together (*fig. 8*) ; the space between the Clips and the Hanger Girder is about $\frac{1}{16}$in. more than sufficient to contain the distance sleeves (*fig. 8*). If incorrect, tighten or slack out the Motor Bolts to locate the Tail Bearing correctly.

Replace the Hanger Bolts, and lock with their Split Pins. Now proceed to replace Pipes, Links, etc., when complete, look carefully over, and see that all necessary lockings are made.

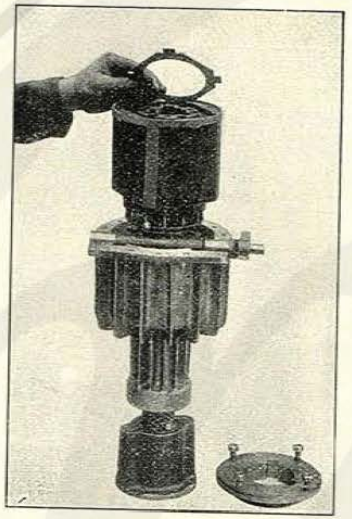

FIG. 9.

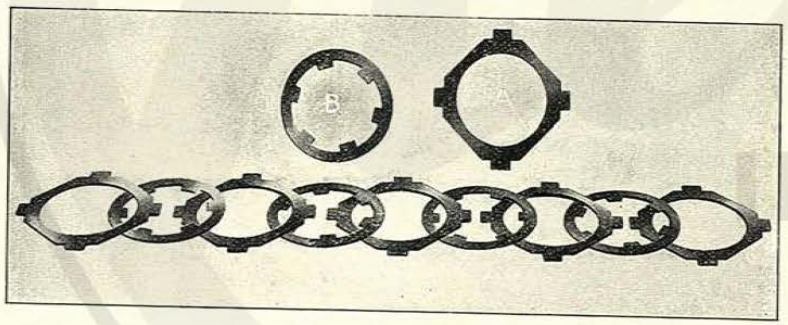

FIG. 10.

DISMANTLING 20 H.P. CLUTCH AND BRAKE TO FIT NEW OR ADDITIONAL DISCS.

Remove the Coupling Shaft.

(For disconnecting the Coupling Shaft Joint *see* p. 3.)

Having removed the coupling shaft, take down the Drip Pan. Next remove the two Set Pins from the Countershaft Tail Bearing Hanger, and remove the hanger straps and packing. Next withdraw the Taper Cotter from the end of the Hand Lever Shaft, and remove the Collar. Slide the Gear Actuating Levers along the shaft (towards the Chassis member) until the Clutch and Brake Link R_4 (*Fig. 12*) can be detached at the fore end.

Take off the two Nuts that hold the Clutch and Brake Actuating Lever and Spring Box, and withdraw the Box (complete with plunger and spring).

Remove the Nuts which attach the Brake Box to the Clutch case, and the Clutch and Brake can be withdrawn together with the Brake Box.

TO PACK THE CLUTCH.

Raise the caulkings of the Lock Washers at the back of the Clutch Box Flange, and remove the four Nuts. Then stand the Shaft on the bench with the Clutch end uppermost. (*Fig. 9*).

Remove the Clutch Box cover (should this cover seem disinclined to come off, insert a sharp edged screwdriver or similar tool between it and the face of the Clutch Box).

The Clutch Rings will now be exposed, and it is only necessary to place an *extern* ring on the top, or, if it be found that there are two extern rings next to each other at the top, remove one of them and put in an *intern* ring in its place, and then replace the extern ring. *Fig. 9* shows hand in the act of placing this ring. *Fig. 10* illustrates *B* extern and *A* intern Clutch Rings.

The Clutch Box cover may now be replaced, and the Locking Washers and Nuts replaced and locked.

To Pack Brake.

The Driving Pot is secured to the Arborshaft by means of a large taper pin, which in turn is kept in place by a split pin.

Remove the Split Pin and drive out the Taper Peg *A*. The Driving Pot *B* can then be withdrawn from the Arborshaft *C*. Now withdraw the Clutch Box and Arborshaft from the Brake Box *D*.

The Brake Discs are confined to their Box by means of a Cover Disc and Split Ring *E* (*fig. 11*), which springs into a groove within the fore end of the Brake Box. Remove the Split Ring, and lift out the Brake Thrust Ring *G*, which will bring the Cover Ring *F* with it. The Discs will now be exposed, and an *extern* ring may be placed on the top of the old ring, or (as explained in describing the Clutch adjustment) if it be found that there are two extern rings next each other, lift out one and put an intern ring in its place, and then replace the extern ring and reassemble the clutch and brake.

N.B.—Care should be taken that the Split Ring is properly replaced, and well home in its groove.

See that the Driving Pot Taper Peg is driven home, and the Split Pin replaced.

N.B.—When replacing the Brake Box see that the faces are clean, and free from any matter that will prevent them coming quite tight, metal on metal, otherwise a leakage of oil will take place.

It will be found convenient when replacing the Arborshaft to arrange the Brake Box vertically, and all the intern rings placed so that the brake sleeve will thread into place. Then hold the Arborshaft well home whilst turning the Box into its side and threading the Thrust Bearing Collars and Driving Pot into place.

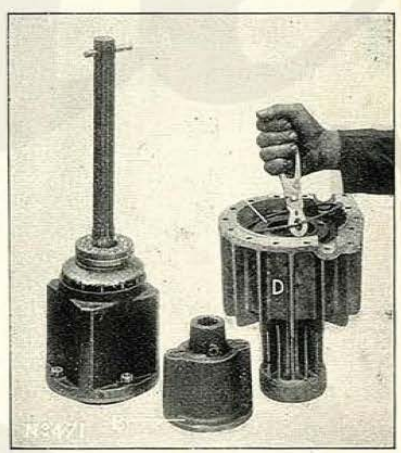

Fig. 11.

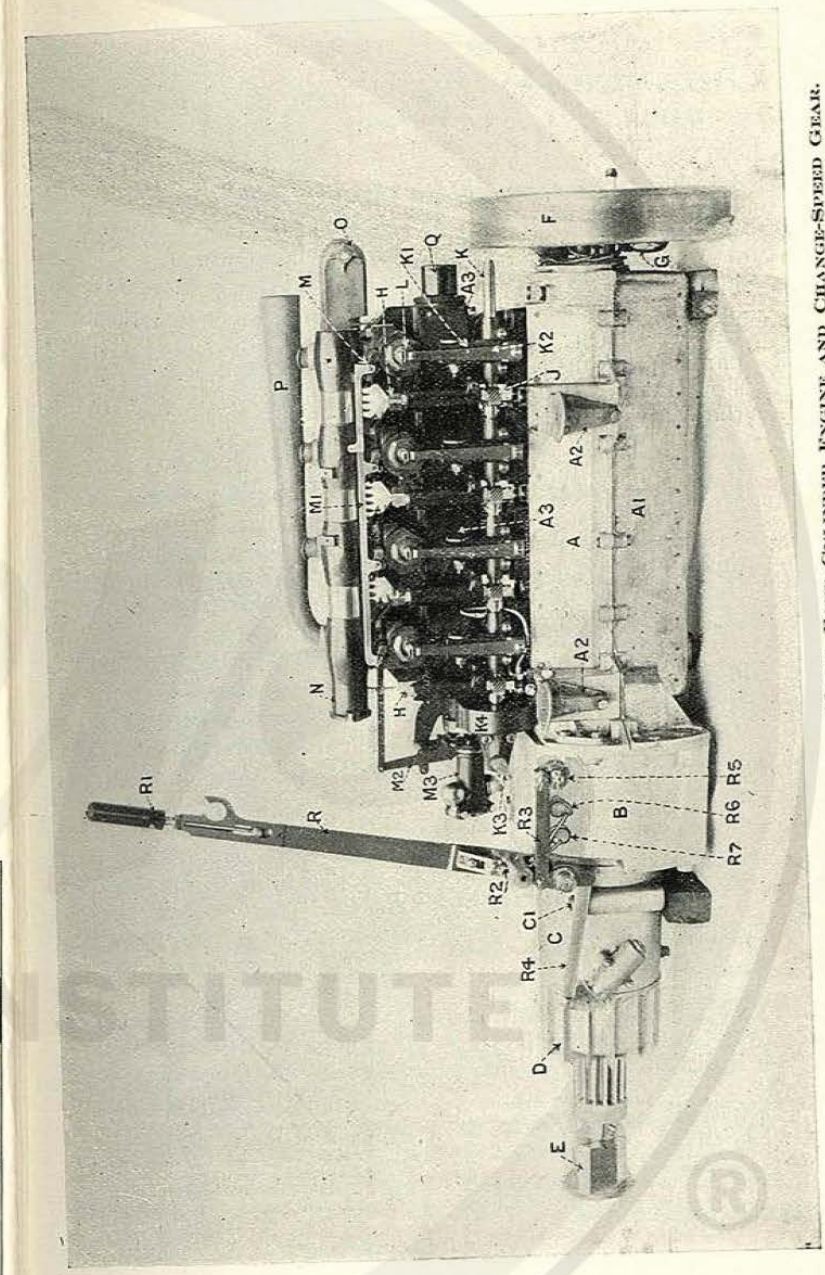

Fig. 12.—Side View of the Lanchester 20 h.p. Four-Cylinder Engine and Change-Speed Gear.

Instructions for Grinding-In Valves of 20 H.P. Lanchester Engine.

In order to test whether the Valves require grinding-in or not, remove the Vapour Pipe *N* (*fig. 12*) and the Exhaust Pipe *O* from the top of the Cylinder Heads. Then fill the Feed and Exhaust Ports with paraffin, taking each Cylinder in turn on its compression stroke. If the Valves leak, bubbles will appear in the Valve Port.

This method may also be followed to ensure that the Valves are properly ground in when re-assembled.

N.B.—After grinding in, having re-assembled the Valve gear, see that the Levers have sufficient clearance and do not hold the Valves off their seats on the compression stroke.

N.B.—If after re-erecting and testing as described above the Engine shows a leakage of compression on the feed side, it may be found that the Valve Seats require tightening up, or possibly they may require a little grinding in.

Explanation of Fig. 12.

A. —Top of Crank Case.
A1.—Crank Pit.
A2.—Motor Support Brackets.
A3.—Cylinders.
B. —Change Speed Gear Box.
C. —Clutch Case.
C1.—Clutch Oil Pipe.
D. —Brake Box.
E. —Driving Pot or Universal Coupling.
F. —Flywheel.
G. —Magneto Armature.
H. —Ignition Shafts and Tweakers.
J. —Ignition Shaft Skew Gears.
K.—Camshaft.
K1.—Cam Box.
K2.—Valve Springs.
K3.—Camshaft Motion Lever for advancing or retarding the ignition.
K4.—Camshaft Gear Box.
L. —Feed Valves.
M. —Throttle Valves.
M1.—Throttle Coupling Link.
M2.—Throttle Lever.
M3.—Centrifugal Governor.
N. —Vapour Inlet Pipe.
O. —Exhaust Pipe.
P. —Water Outlet Pipe.
Q. —Water Inlet.
R. —Change Speed Hand Lever.
R1.—Change Speed Handle.
R2.—Change Speed Bell Crank Lever.
R3.—Reversing Link.
R4.—Clutch and Brake Link.
R5.—Reverse Lever.
R6.—Low Speed Lever.
R7.—Compound or Second Speed Gear Lever.

Slack out the Set Pins which attach the Valve Spring K_2 on their lower end.

Depress the upper end of the Spring and remove the Valve Links connecting the Valves to the Spring.

Swing the Springs over sideways to get them out of the way of the Valve Stems and Valve Seats. Remove the split pins and nuts which carry the Valve Levers within the cam boxes, and remove the Lever Pins. Then withdraw the Levers from the cam boxes.

Next, unscrew the haxagon nuts that hold the Feed Valve Seats into the Cylinder Heads, and having removed these parts the Valve Seats may be withdrawn, after removing a small hexagon-headed glut which will be found screwed into the Cylinder Head on the left side of these Valve Ports.

The Feed Valves can now be ground into their seatings away from the engine.

To Grind Valves in, place the Seating in a hand vice or suitable fix, holding it between lead or soft metal clamps.

Clean the Valve Seats, and if there is any carbon deposit on them, or round them, scrape it off. Take some fine grain emery (Oakey's No. 90) and mix a little with some paraffin, making a thin paste. Spread a little of this paste on the seat of the Valve, and having put it in place, in its seating, give it a rotational movement, by preference using a swing brace to rotate it.

The grinding in may be done with an ordinary screw-driver; but this method will be found more tedious and less likely to make a good seat than giving the Valves a continuous rotary motion with a steady and even pressure holding them to their seats.

During the process of grinding the Valves should be occasionally lifted from their seats and put down again in a different position, in order to as far as possible prevent the emery grain from embedding itself into the seat in any particular place.

If the Valve Seats become dry during the process, lubricate with a little fresh paraffin, and when necessary add a little more emery.

IN ORDER TO GRIND IN THE EXHAUST VALVES, having removed the springs and valve links, remove the Exhaust Valve through the Feed Port. These Valves may be pushed out with a rod through the Valve Stem Guides, or if the Valves are closed, a smart rap on the spindle end with a mallet or piece of wood will eject them through the Feed Ports.

Now place the Engine in such a position that the Piston of the Cylinder that is being operated on is in its topmost position, and fill the combustion space with a piece of cotton rag or a duster. (Avoid using cotton waste, or anything that may leave a portion behind, when withdrawn from the cylinder.) This precaution is to avoid getting grains of emery into the Cylinder, which might obviously prove detrimental to the Cylinder Walls and the Piston.

Now place some of the grinding paste on the Valve Seat, and grind it to its seating in the Cylinder Head in the manner described for grinding the Feed Valves in.

In order to test whether the grinding in has been successfully done, carefully dry and clean the Valve Seating and the Valve itself. Then lay an even coat of soot round the Valve Seat by holding the Valve over a small oil lamp flame or a candle flame, and rotate the Valve until the bright surface of the Seat is entirely obscured. Then place the Valve in its Seating, and pressing it gently home, give it a slight rotational motion (about $\frac{1}{8}$in.) to and fro two or three times If the Valve is correctly ground in, this process will remove the smoke, showing a clean contact all round the Seat.

The preliminary process for testing the Valves may be repeated before re-assembling the Engine.

REMOVING GEAR BOX.

Preliminaries, *see* pp. 4 and 5.

Slack out the three Gear Adjustment Screws until none of the Gears can be used. Remove the Split Pins *A A A A* (*fig. 13*). Detach the Tie Strap R_8, and the Reverse Link R_3.

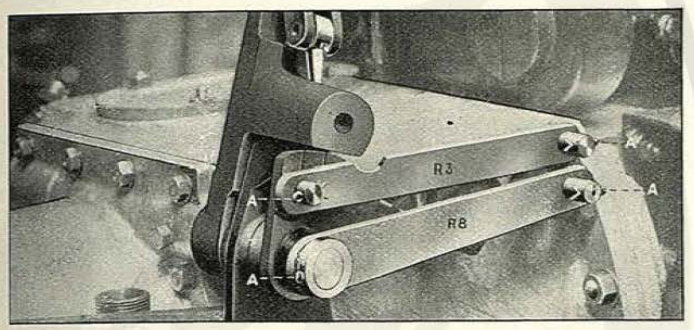

FIG. 13.

Remove the Change Gear Actuating Lever, and then the Spacing Washers (sliding them off the Hand Lever Boss). Slack out the Nuts that attach the Clutch Case to the Gear Box, and the Set Pin *C* (*fig. 13*), and slide the Change Speed Lever Pin out towards the left side of the Chassis, allowing the Change Speed Lever to be displaced from its pin.

Remove the Split Pin from the Clutch Actuating Lever, and detach the Clutch and Brake Link.

Detach Return Oil Pipe from the Well underneath the Gear Box.

Now proceed to remove all Set Pins which attach the gear box to the crank case, and remove Gear Box by withdrawing it back, away from the Engine.

When replacing, pack the Roller Bearing Groove in Compound Gear Drum full of thick grease (solidified oil or Lanchester Worm Grease or any similar grease that is soluble, in ordinary hydro-carbon lubricating oil), and place the Rollers well in position.

For the sake of convenience, place the Crank Shaft so that the Clutch Driving Sleeve has one of its feathers at the top, and also turn the Clutch Intern Sleeve so that one of its grooves is at the top to correspond.

Then slide the Gear Box into place, taking care that the Rollers do not get out of position.

When replacing the Change Gear Actuating Levers see that they are put up in the correct order, and that the Spacing Washers are replaced in the same places from which they were removed.

These Levers should be quite free in movement, but not slack laterally.

RE-FLASHING MAGNETS
FOR 20 H.P. LANCHESTER CAR.

Place the Flywheel in a position so that the Key points diagonally in either position, as shown in *fig. 13*.

Connect one of the Cables conducting the current to the Bus Bar on the top of the Vapour Pipe.

Place the Switch in the starting position, and, taking the other Cable, make a series of contacts on any suitable part of the Engine, such as the Vapour Pipe or the Exhaust Pipe (about 15 or 20 contacts of approximately a second's duration each will be sufficient).

During this process it is advisable to disconnect the four Sparking Plugs, in order to avoid the possibility of an accidental short circuit.

This process can be carried out from any ordinary electric-lighting circuit, but a current of not less than 20 volts is sufficient.

When using a current of low voltage a *continuous* contact of 10 or 15 seconds may be made. But when using the ordinary electric lighting current an intermittent contact should be made, so as to run no risk of burning the Armature out.

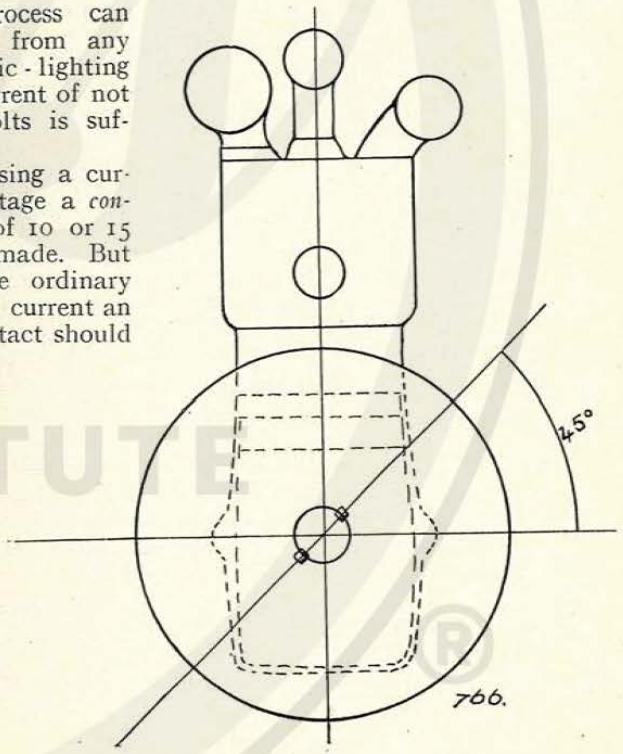

FIG. 14.

Instructions for Locating a Fault in Lanchester Magneto Ignition.

1. When the ignition is suspected of being defective and a fault cannot be readily found, and there is not an obvious defect showing, such as a disconnected wire, broken spring, burnt out wire, points set too far apart and spark outside, or a wire which has the insulation chafed through, or points set too closely, it is advisable to proceed in the following manner :—

2. Take out all the Igniters. Select one Igniter about which there is the least doubt of its good condition. Place it in its position in the Cylinder, first setting the Sparking Points wide apart. Take off the casing which covers the leads from the Armature, and note that the connections with the Armature are in order. Connect the lead from the Starting Coil of the Armature direct to the terminal of the Igniter in position in the engine. Place the Spark Lever in the retard position, and turn the Engine with starting handle. A good spark should be obtained between the Igniter Spring and the Tweaker, which will prove the Starting Coil of the Armature to be in good order. Spark Lever should then be advanced fully, and the lead from the Running Coil connected up to the Igniter. Spark of similar character should then be obtained at Tweaker and Spring, and which would prove that the Running Coil is in order. Should there be no spark obtainable on either Running or Starting Coils, it is advisable to select another Igniter, and repeat the process. If still no spark, yet another Igniter, and so on until all the Igniters have been used. The object of trying so many Igniters if there is no spark is to reduce the chances of using a faulty Igniter to test the Armature with. It is extremely unlikely that the whole of the five Igniters on the car would be defective.

3. If after trying all the Igniters no spark is obtained, the Armature Leads should then be carefully examined to make sure the insulation is in good condition. Also that the Cable Terminals on

the ends of the armature leads are making good connection both with the wire and the terminal pegs. The ignition timing may then be examined, and if found incorrect should be adjusted, and another trial made to obtain a spark. If unsuccessful the Magnet Wheel may then be removed and the magnetism tested. If found to be weak, may be re-flashed according to the instructions in page 21, and still another trial made to obtain spark. If still no spark, it may safely be assumed that the Armature is at fault, and it should be removed for the purpose of testing it, both for continuity and leakage, in the following manner :—

4. Disconnect the earthed ends of the Armature Coils by removing the screws which attach them to the armature plates. Connect an Armature Terminal to one of the Terminals of an Accumulator. Connect the other end of the same Armature Coil (which will be diametrically opposite to the terminal already connected) to the other terminal of the Accumulator. If a current is flowing, a spark will be noticed when the connections are made and broken with the Accumulator, and will indicate that the winding is continuous. This process should be repeated with the other coil of the Armature.

For testing the insulation of the Armature, first, from winding to earth, a Galvanometer is required and a current of fairly high voltage, say that from the electric light main. One wire from the main should be connected to a terminal of an Armature Coil. The loose end of the same Coil should then be connected to one of the terminals of a Galvanometer. The other terminal of the Galvanometer should then be connected to the Armature Core. The other wire from the electric light main should then also be connected to the Armature Core. If any deflection is noted on the Galvanometer Needle, it is proof that the Armature Insulation is at fault. Should there be no deflection, the insulation to that particular Coil is in good order. Process should then be repeated with the other Coil. Then the Armature

should be tested for insulation between Coil and Coil, and the following connections made to do this :—

Connect wire from main to one Armature Terminal. Connect wire from other Armature Terminal to one terminal of Galvanometer ; wire from other terminal of Galvanometer to other electric light main. Any deflection on the Needle will indicate a short circuit between the Armature Coils. Care must be taken during this process to see that the freed ends of the Armature Coils do not touch the Armature Core. Should the Armature be found defective, it will be necessary to be returned to be repaired.

To return to the process of testing for spark at Tweaker and Spring :—

5. Should a good spark be obtained, the Armature Leads may be replaced in their casing, and the proper connections made through the Switch and Bus Bar, which can then be tested by noting if a spark is still obtained at Tweaker and Spring. Should a spark not be obtained, the insulation of Bus Bar may require renewing, or, possibly, only cleaning, or the Bus Bar may be touching the Vapour Pipe or the Studs which secure it, or else the Switch may be at fault. The sliding portion of the Switch may be greasy and dirty. One of the Switch Springs may have slipped out of place, and be touching the Vapour Pipe, or the Vulcanite Switch Block may require cleaning. When the spark has been obtained with the proper connections made, the Igniters may then be replaced one by one, and as each Igniter is connected up to the Bus Bar it should be tested separately. Should it be short, the spark obtained at the Igniter which was first placed in position will be extinguished; and, should this be so, the faulty Igniter will readily be located. This process to be repeated until the remaining Igniters have been tested in a similar manner. Any repairs to the insulation can then be effected, and when repaired should be tested as prescribed.