WORKSHOP MAINTENANCE MANUAL

FOR

Royal Enfield

'Made like a Gun'

MOTOR CYCLES

THE ENFIELD CYCLE COMPANY LIMITED

HEAD OFFICE AND WORKS:
REDDITCH, WORCESTERSHIRE, ENGLAND

Telephone:
Redditch 4222 (9 lines)

Telegrams:
"Cycles, Redditch"

WEST OF ENGLAND SERVICE DEPT. AND BRANCH WORKS:
BRADFORD-ON-AVON
WILTSHIRE

Telephone:
Bradford-on-Avon 2188

Telegrams:
"Cycles, Bradford-on-Avon"

FRAME 6190 58/313 8 00 Mr Whittington, meadow Farm ruibol lane

ENGINE No SM 7705

AAG 484 CB

lane Farlands Ripley Derbyshire Ripley 2348

WORKSHOP MAINTENANCE MANUAL

FOR THE

Royal Enfield

'Made like a Gun'

1960 "METEOR MINOR SPORTS"

1958-60 "METEOR MINOR" de LUXE

1958-59 "METEOR MINOR" STANDARD

and "AIRFLOW"

MOTOR CYCLE

THE ENFIELD CYCLE COMPANY LIMITED

HEAD OFFICE AND WORKS:
REDDITCH, WORCESTERSHIRE, ENGLAND

Telephone: Redditch 4222 (9 lines)
Telegrams: "Cycles, Phone, Redditch"

WEST OF ENGLAND SERVICE DEPT. AND BRANCH WORKS:
BRADFORD-ON-AVON
WILTSHIRE

Telephone: Bradford-on-Avon 2166
Telegrams: "Cycles, Phone, Bradford-on-Avon"

FRAME 6190
ENGINE No SM 7705
58/313

CB.
AAG 484

WORKSHOP MAINTENANCE MANUAL

FOR THE

Royal Enfield

'Made like a Gun'

1960 "METEOR MINOR SPORTS"
1958-60 "METEOR MINOR" de LUXE
1958-59 "METEOR MINOR" STANDARD
and "AIRFLOW"
MOTOR CYCLE

TRADE MARK
'MADE LIKE A GUN'

THE ENFIELD CYCLE COMPANY LIMITED

HEAD OFFICE AND WORKS:
REDDITCH, WORCESTERSHIRE, ENGLAND

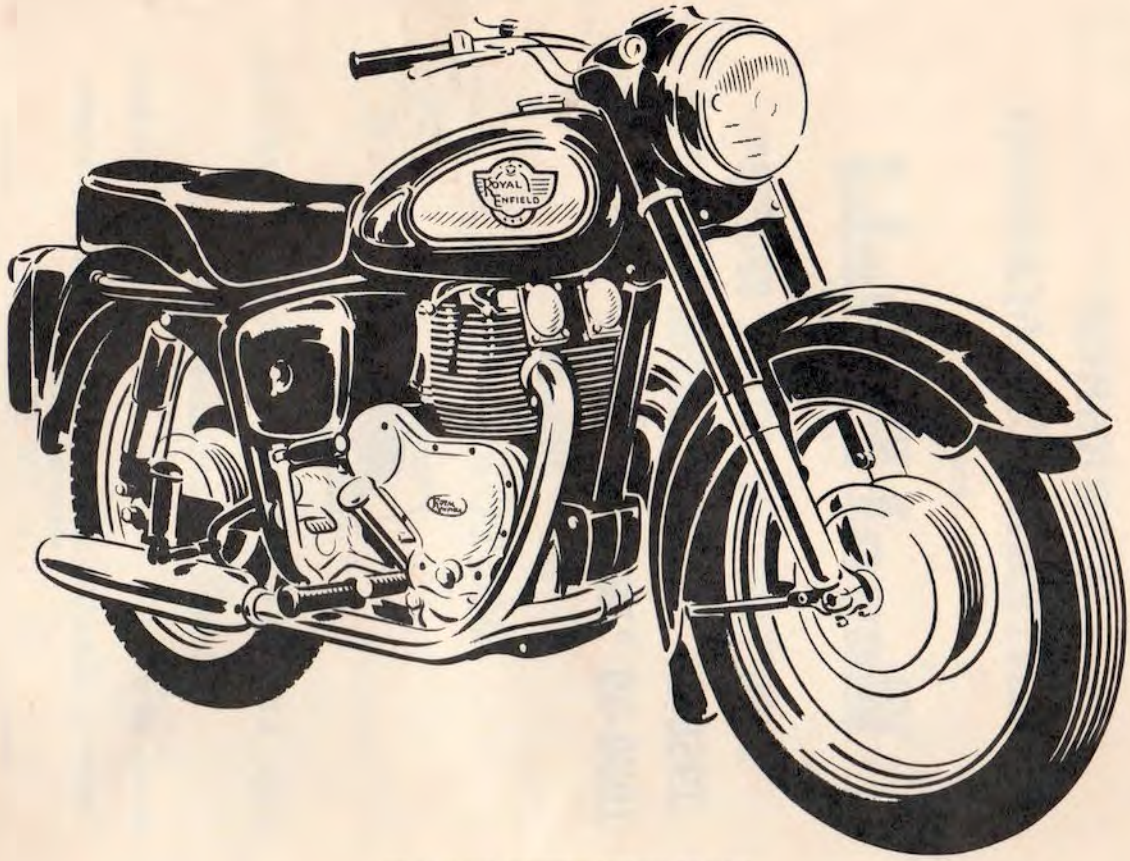
Telephone: Redditch [illegible] (9 lines) 4222

Telegrams: "Cycles, Phone, Redditch"

WEST OF ENGLAND SERVICE DEPT. AND BRANCH WORKS:
BRADFORD-ON-AVON
WILTSHIRE

Telephone: Bradford-on-Avon 2166

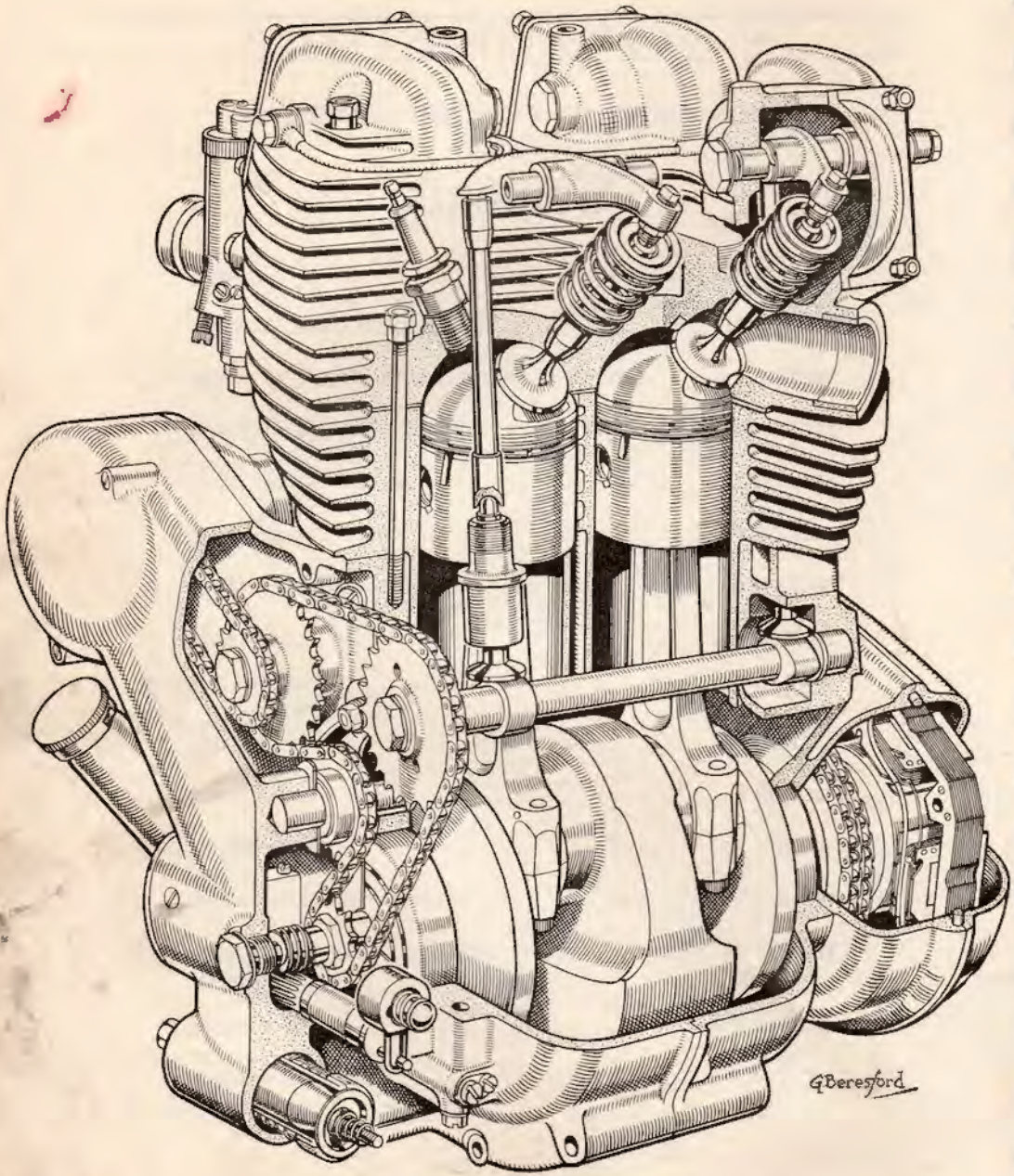
Telegrams.: "Cycles, Phone, Bradford-on-Avon"



496 c.c. O.H.V. "METEOR MINOR" DE LUXE
(Frontispiece)

"METEOR MINOR" AND "METEOR MINOR SPORTS"

Contents



SECTIONAL VIEW OF "METEOR MINOR" ENGINE

SECTION A13

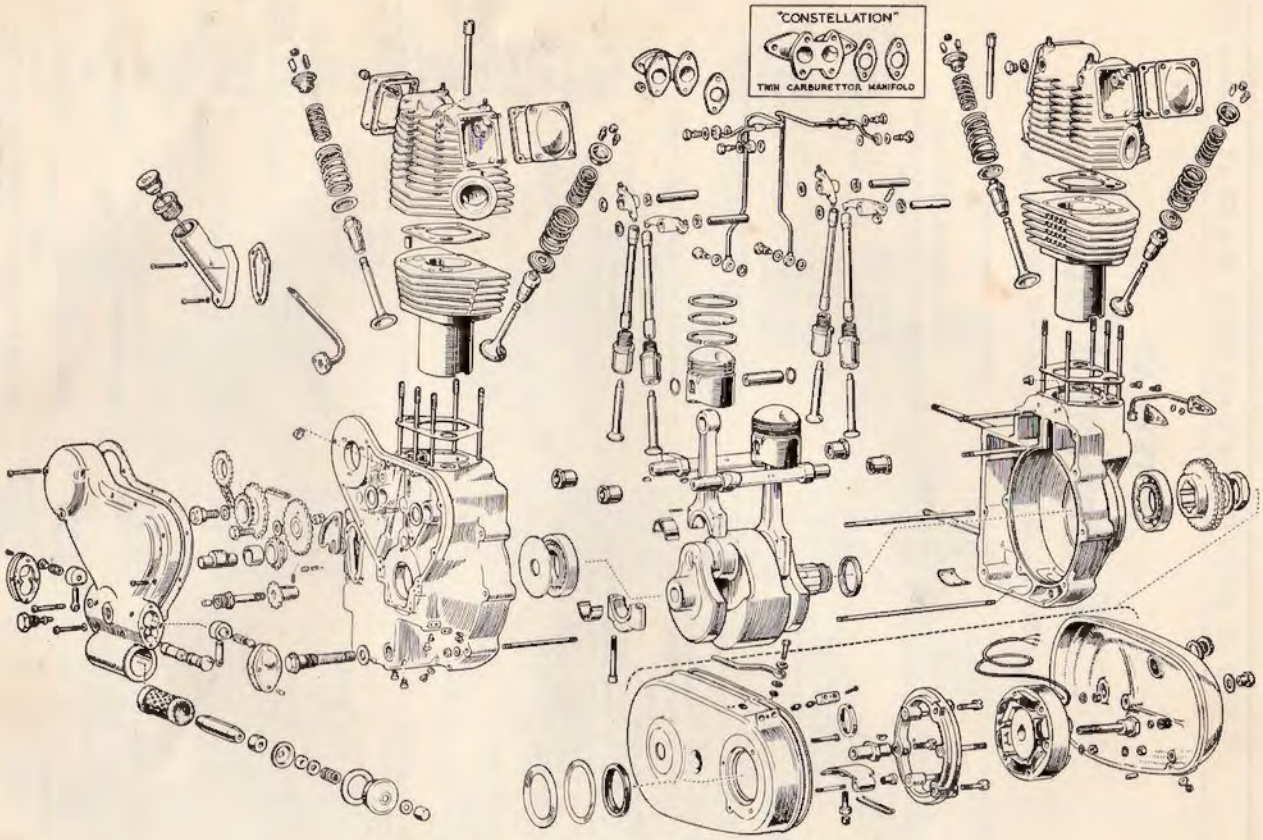
Technical Data

"Meteor Minor" Standard, de Luxe and Sports Engines

Cubic capacity			496 c.c.
Stroke	Nominal		64·5 mm.
Bore	Nominal		70 mm.
	Actual		69·874 mm. (2·751 in.)

(Rebore to ·020 in. oversize when wear exceeds ·0065 in. and again to ·040 in. after further ·0065 in. wear.)

Compression ratio	8 to 1
Piston diameter—	
Bottom of skirt—	
Fore and aft	69·811 mm.
Top lands (early models)	69·40/69·35 mm.
Top lands (later models)	69·31/69·23 mm.
Skirt is tapered and oval-turned.	
Piston rings—	
Width—Plain ring	·0625/·0635 in.
Scraper ring	·1550/·1560 in.
Radial thickness	2·883/3·085 mm.
Cap when in unworn cylinder	·011/·015 in.
Clearance in grooves	·001/·003 in.
Renew piston rings when gap exceeds $\frac{1}{16}$ in.	
Oversize pistons and rings available ·020 and ·040 in.	
Piston boss internal diameter	·7499/·7501 in.
Gudgeon pin diameter	·7499/·7501 in.
Con. rod small end internal diameter	·7507/·7505 in.
Big end internal dia. (early models)	1·8760/1·8755 in.
Big end internal dia. (later models)	2·0215/2·0210 in.
Crank pin diameter (early models)	1·7715/1·7710 in.
Crank pin diameter (later models)	1·8750/1·8745 in.
Driving side main ball bearing—	
Type	Hoffman—145 or R and M—LJ45
Outside diameter	85 mm.
Inside diameter	45 mm.
Width	19 mm.
Timing side main roller bearing—	
Type	Hoffman—R145 or R and M—LRJ45
Outside diameter	85 mm.
Inside diameter	45 mm.
Width	19 mm.
Rocker inside diameter	·5627/·5622 in.
Rocker bearing inside diameter	·5622/·5617 in.
Rocker spindle diameter	·5617/·5615 in.
Inlet valve stem diameter	·3430/·3425 in.
Exhaust valve stem diameter	·3410/·3405 in.
Valve guide internal diameter	·3437/·3447 in.
Valve guide external diameter	·6275/·6270 in.
Valve guide hole in cylinder head dia.	·625/·626 in.
Tappet stem diameter (early models)	·3743/·3740 in.
Tappet stem diameter (later models)	·375/·374 in.
Tappet guide internal diameter (early models)	·3755/·3745 in.
Tappet guide internal diameter (later models)	·376/·375 in.
Tappet guide external diameter	1·0125/1·0130 in.
Tappet guide hole in crankcase dia.	1·011/1·010 in.
Tappet clearance with cold engine—	
Standard, de Luxe and Sports models—	
Inlet	Nil } Normal
Exhaust	Nil } running
Sports model—	
Inlet	Nil } Continuous
Exhaust	·005 in. } high-speed running
Valve spring free length—	
Standard and Early de Luxe models—	
Inner	2 $\frac{3}{32}$ in.
Outer	2 $\frac{3}{32}$ in.
(Renew when reduced by $\frac{1}{32}$ in.)	
Sports and Later de Luxe models—	
Inner	1 $\frac{1}{2}$ in.
Outer	1 $\frac{11}{16}$ in.
(Renew when reduced by $\frac{1}{32}$ in.)	
Valve timing with ·012 in. tappet clearance—	
Standard and de Luxe models—	
Exhaust opens	75° before B.D.C.
Exhaust closes	35° after T.D.C.
Inlet opens	30° before T.D.C.
Inlet closes	60° after B.D.C.
Sports model—	
Exhaust opens	83° before B.D.C.
Exhaust closes	35° after T.D.C.
Inlet opens	30° before T.D.C.
Inlet closes	60° after B.D.C.
Camshaft bearing external diameter	·9095/·9085 in.
Camshaft bearing internal diameter (Bored in position in crankcase.)	·7505/·7495 in.
Cam and valve lift—	
Standard, de Luxe and Sports models—	
Inlet cam lift	·3125 in.
Inlet valve lift (approx.)	·3125 in.
Standard and de Luxe models—	
Exhaust cam lift	·3125 in.
Exhaust valve lift (approx.)	·3125 in.
Sports models—	
Exhaust cam lift	·328 in.
Exhaust valve lift (approx.)	·328 in.
Timing sprocket	12 teeth
Camshaft sprocket	24 teeth
Distributor sprocket	15 teeth
Timing chain—Type	Single No. 110038 endless
Length	66 pitches
Width	·225 in.
Pitch	·375 in.
Roller diameter	·250 in.
Distributor chain—Type	Single No. 110500 endless
Length	40 pitches
Width	8·64 mm.
Pitch	8 mm.
Roller diameter	5 mm.
Distributor speed	half engine speed
Points gap	·015 in.
Timing retarded	$\frac{1}{32}$ in. before T.D.C.
Timing advanced	$\frac{3}{8}$ in.—$\frac{1}{16}$ in. before T.D.C.
Engine sprocket	29 teeth
Clutch sprocket	56 teeth
Final drive sprocket (solo)	19 teeth
Primary chain type	Duplex No. 114038 endless
Length	92 pitches
Width	·628 in.
Pitch	·375 in.
Roller diameter	·250 in.
Feed Oil Pump—Speed	1/6 engine speed
Piston diameter	·24975/·24950 in.
Stroke	·5 in.
Return Oil Pump—Speed	1/6 engine speed
Piston diameter	·375/·3755 in.
Stroke	·5 in.
Sparking Plug—Type: Up to Engine No. SMCA 7027	Lodge H.14, K.L.G. F.70, Champion L10S
From Engine No. SMCA7028	Lodge H.L.N., K.L.G. F.E.70, Champion N.A.8
Diameter	14 mm.



EXPLODED VIEW OF "METEOR MINOR" ENGINE (later models)
Fig. 1

SECTION B13

Engine Specification

"Meteor Minor" Standard, de Luxe and Sports Engines

1. Engine

The engine is an even-firing vertical twin-cylinder, having separate cylinders and heads and fully enclosed pressure-lubricated overhead valve gear. It has a dry sump lubrication with the oil tank integral with the crankcase and a massive one-piece high-strength spheroidal graphite cast iron crankshaft.

2. Cylinder Heads

The cylinder heads are die-cast from light aluminium alloy with ample finning to ensure adequate cooling. The exhaust pipe inserts are cast-in and the valve inserts are of austenitic iron and are shrunk in so that they are replaceable. The large capacity induction ports are streamlined and blended to the valve seatings.

3. Cylinders

The separate cast iron cylinders have a nominal bore of 70 mm., the stroke being 64·5 mm. The cubic capacity of the engine is 496 c.c. The cylinder heads are located on the cylinders by hollow dowels.

4. Pistons

The high compression pistons are of low expansion aluminium alloy, heat treated and form-turned oval and having split skirts. The compression ratio is 8 to 1. There are three piston rings, the top two of which are compression rings. Both are taper ground and the top one is chromium plated. The third ring is for oil control and is slotted.

5. Connecting Rods

The connecting rods are produced from stampings of Hiduminium RR56 light alloy. The little end bearings are of alloy direct on to the gudgeon pin. In case of wear after long service the little end can be bored out and fitted with a bush, but this is rarely necessary.

The big end bearings consist of white-metalled steel liners which are renewable. The detachable bearing caps are bolted to the connecting rods by means of high tensile socket screws, secured by cotter pins.

6. Crankcase

The combined crankcase and oil tank is die-cast from light alloy in two halves, being split vertically.

7. Crankshaft and Flywheel

The crankshaft is cast in one piece, integral with the massive central flywheel, from high quality spheroidal graphite cast iron. The total weight is approximately 22½ lb. and it is carefully balanced.

The main journals are ground and the big end journals are ground and hand-lapped. The main journal on the drive side of the later type crankshaft is drilled through its centre for situation and operation of the crankcase breather.

8. Main Bearings

Heavy duty bearings are provided for the crankshaft, the driving side being ball and the timing side roller.

9. Camshafts

The camshafts are machined from drop forged steel stampings with the cams and bearings hardened and ground. The inlet and exhaust cam profiles of Standard and de Luxe models, and the inlet cam profiles of the Sports models are produced with silencing ramps to ensure quiet running. The exhaust cams of the Sports model do not possess silencing ramps.

10. Valves

The inlet valves are machined from stampings of special silicon-chrome valve steel and the exhaust valves are of austenitic steel.

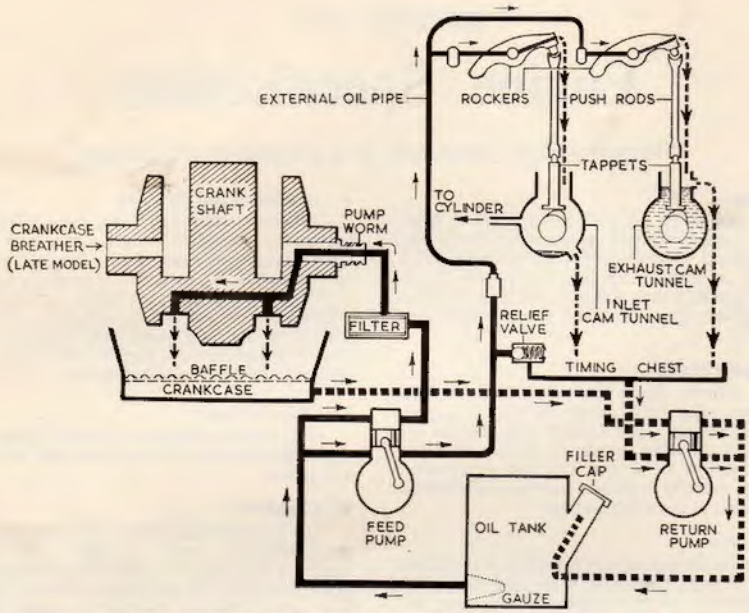
11. Valve Gear

The valves are operated from the camshafts by means of large flat based guided tappets, tubular alloy push rods and overhead rockers. Two compression springs are fitted to each valve.

12. Timing Drive

The camshafts are located in the crankcase, running in bronze bushes. They are driven by a common, endless chain from the timing sprocket on the crankshaft and the tightness of the chain can be adjusted by means of the chain tensioner in the timing chest.

The distributor is driven by a separate endless chain from the rear camshaft sprocket in the timing chest. The tension of this chain is adjusted by moving the distributor fixing bolts in their slotted holes.



"METEOR MINOR" LUBRICATION SYSTEM. Diagrammatic Arrangement
Fig. 2

13. Ignition and Lighting System (see Section G)

The ignition and lighting are provided by means of Lucas alternator, coil and distributor.

The alternator is housed in the primary chaincase, the permanent magnet rotor being mounted on the end of the crankshaft and the six-coil stator fixed to the back of the chaincase.

The distributor is chain-driven from the inlet camshaft at half-engine speed and has a built-in automatic advance mechanism.

Lighting current is supplied by the battery which is charged through a rectifier from the alternator.

For normal running the ignition current is also supplied from the battery but, if the battery should be run down, starting can be effected by turning the ignition switch to the "Emergency" position which permits the distributor to be supplied direct from the alternator.

14. Carburettor (see Section F)

Amal Monobloc, Type 376/92. Bore $1\frac{1}{16}$ in.

Main jet	...	250
Needle jet	...	106
Pilot jet	...	30 c.c.
Throttle valve	...	No. $3\frac{1}{2}$
Needle position	...	No. 2
Pilot outlet	...	·025 in.

15. Air Filter

The air filter is a Vokes Micro-Vee felt and gauze dry filter, 5 in. diameter and housed in a compartment of the toolbox.

16. Lubrication System

Lubrication is by the Royal Enfield Dry Sump system which is entirely automatic and positive in action. The oil tank is integral with the crankcase, ensuring the full rate of circulation immediately the engine is started and rapid heating of the oil in cold weather.

There are two positively driven piston type oil pumps running at $\frac{1}{2}$ engine speed, one at the rear of the timing cover for pumping oil to the bearings under pressure and the other at the front for returning the oil from the crankcase to the tank. The return pump has a capacity approximately double that of the feed pump which ensures that oil does not accumulate in the crankcase.

The oil from the big ends drains into the bottom of the crankcase and is prevented by a baffle from being drawn up by the flywheel.

The oil from the rocker bearings is squirted through a small hole in the rocker on to the top end of the push rod. It flows down the push rod into the cam tunnel where it lubricates the cams and tappets and thence into the timing chest, lubricating the timing chains. There are small holes from the inlet cam tunnel through the cylinder walls for the purpose of lubricating the skirts of the pistons and a hole from the inlet cam tunnel into the timing chest through which surplus oil from the inlet rockers passes.

The exhaust cam tunnel, however, has no holes but is kept full of oil to ensure adequate lubrication of the exhaust cams and prevent wear. The oil level is maintained to a height in the groove in the tappet guide where a hole is drilled into the timing chest, through which surplus oil from the exhaust rockers passes.

Both pumps are double acting, one side of the feed pump supplying the big ends only and the other side the rockers and valve gear. In a similar manner one side of the return pump pumps the big end oil back to the tank from the crankcase and the other side the valve gear oil back to the tank from the timing chest.

A spring loaded relief valve controls the pressure of the oil to the valve rocker gear which is through external pipes.

A gauze strainer is provided for the feed oil leaving the tank and there is a large capacity felt filter in the feed to the big ends. An aluminium cylinder is fitted over the fixing stud inside the filter element to reduce the volume of oil required to fill the filter after it has been dismantled for cleaning and to ensure the rapid flow of oil to the big ends.

A small circular magnet is also fitted over the fixing stud inside the oil filter for the purpose of collecting any ferrous particles which may be suspended in the oil.

17. Breather

The efficient operation of the breather is of paramount importance to the performance of the engine as it acts as a non-return valve between the crankcase and the outside atmosphere, causing a partial vacuum in the crankcase and rocker boxes which prevents the passage of oil into the cylinders and consequent smoking and oiling of the plugs.

The breather is located on the driving side of the crankcase and consists of a small housing attached to the crankcase by three screws. This housing contains two pen-steel discs covering two holes drilled into the crankcase. Accurate seating of the discs is ensured by a pen-steel plate held between the breather body and the crankcase.

The Neoprene pipe, found on early models, which breathes directly into the atmosphere from the breather housing, has been replaced on later models by a metal pipe running from the breather housing to the top of the oil tank.

In addition a breather, in the form of a pen-steel disc, is situated in a recess in the head of the special bolt, which secures the alternator rotor on to the end of the crankshaft. This bolt is drilled throughout its length, and communicates crankcase pressure to the breather via the hole drilled through the drive side main journal.

A plug screwed into the head of the bolt retains the disc, and a hole drilled in its centre allows the crankcase to breathe into the primary chaincase.

A vent pipe fitted to the top of the primary chaincase has its aperture inside the case shielded by a baffle from oil flung from the chain. (See Section C, Fig. 7.)

18. Gearbox

The gearbox is bolted on to the back of the crankcase and has four speeds, which are foot controlled, and a patented neutral finder. All gears are in constant mesh, changes being effected by robust dog clutches. (See Section E.)

The Standard gear ratios are as follows:

Early models:	
Bottom gear	13·00
Second gear	8·42
Third gear	6·08
Top gear	4·67
Later models:	
Bottom gear	13·00
Second gear	8·6
Third gear	6·37
Top gear	4·67

19. Clutch

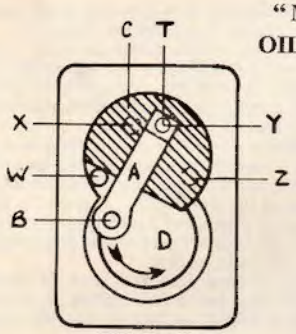
The clutch has five pressure plates and four friction plates, including the sprocket which is lined on both sides with friction material. The other friction plates of early models have Klinger inserts; later models have the first plate in order of assembly, with Klinger inserts, and the other two a bonded-on friction material.

These clutches give smooth operation and freedom from slipping in the presence of oil.

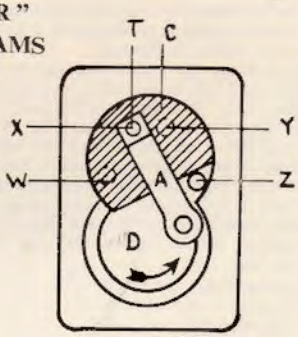
The operating mechanism of the clutch is of the latest Enfield design which enables stronger clutch springs to be used without increasing the force required to operate it, thus giving increased load carrying capacity to the clutch.

A description of the operating mechanism is given in Section E.

"METEOR MINOR" OIL PUMP DIAGRAMS



FEED PUMP
POSITION 1



FEED PUMP
POSITION 2

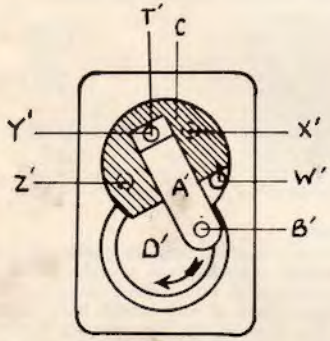
Fig. 3A

The ports in the housing are connected as follows:

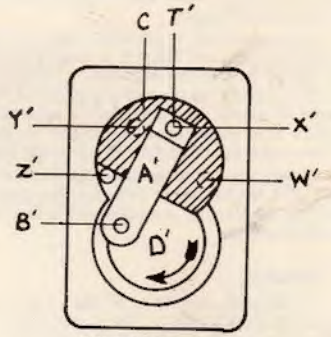
W — delivery to rocker gear.
X — delivery to big ends.
Y — suction from oil tank.
Z — suction from oil tank.

Position 1. The plunger A is being drawn out of the cylinder hole in the disc C by the action of the peg B on the shaft D. The port T in the disc C registers with the suction port Y in the housing, so that oil is drawn into the cylinder from the oil tank. At the same time the delivery port W in the housing is uncovered and oil below the disc in the housing is forced through W to the rocker gear.

Position 2. The plunger A is being pushed into the cylinder hole in the disc C. The port T in the disc now registers with the delivery port X in the housing, so that oil is forced out of the cylinder to the big ends. At the same time the suction port Z in the housing is uncovered and oil is drawn into the housing below the disc from the oil tank.



RETURN PUMP
POSITION 1



RETURN PUMP
POSITION 2

Fig. 3B

The ports in the housing are connected as follows:

W′ — delivery to oil tank.
X′ — delivery to oil tank.
Y′ — suction from crankcase.
Z′ — suction from timing chest.

Position 1. The plunger A′ is being drawn out of the cylinder hole in the disc C′ by the action of the peg B′ on the shaft D′. The port T′ in the disc C′ registers with the suction port Y′ in the housing, so that oil is drawn into the cylinder from the crankcase sump. At the same time the delivery port W′ in the housing is uncovered and oil below the disc in the housing is forced through W′ back to the oil tank.

Position 2. The plunger A′ is being pushed into the cylinder hole in the disc C′. The port T′ in the disc now registers with the delivery port X′ in the housing, so that oil is forced out of the cylinder back to the oil tank. At the same time the suction port Z′ in the housing is uncovered and oil is drawn into the housing below the disc from the timing chest.

SECTION C13

Service Operations with Engine in Frame

"Meteor Minor" Standard, de Luxe and Sports

1. Removal of the Timing Cover

First place a tray under the engine to catch the oil which will escape when the cover is removed. Remove the timing side exhaust pipe. Remove the oil filler neck by taking out the three screws fixing it to the crankcase. Remove the timing cover fixing screws. Draw off the timing cover, tapping it lightly if necessary.

In refitting the cover, insert the two long screws through the cover to locate the gasket. See that the thrust washer is on the chain tensioner sprocket spindle and that the neoprene seal is in position on the oil feed plug. If the seal or plug is damaged a new one of either should be fitted. The seal is Part No. 42114 and the plug is Part No. 42113.

The refitting of the cover will be facilitated if the engine is turned gently forwards while the cover is being put into place. This will help the engagement of the pump worm with the pump spindle and prevent damage to the gears.

Always fill the filter with clean oil before refitting the timing cover and always take great care not to damage the gasket where the section is narrow.

To verify that the oil pumps are working after replacing the timing cover, start the engine and slacken the feed plug between the oil pumps. The return oil pump can be checked by removing the oil filler cap so that the oil return pipe can be seen. It may take several minutes for all the oil passages to fill and the oil to commence circulating. The feed to the rockers can be observed by removing the rocker box covers, when oil will be seen flowing down the surface of the push rods.

2. Valve Timing

The camshaft sprockets are keyed to the camshafts so that the valve timing can only be incorrect if the timing chain is incorrectly fitted.

The correct setting is obtained with the marks stamped on the camshaft sprockets facing each other inwards on the centre line and the mark on the crankshaft sprocket pointing vertically downwards. If it is necessary to remove the sprockets see Sub-sections 23 and 24.

Remember that all three timing sprockets fixing bolts have **Left-Hand Threads.** While tightening the camshaft bolts the sprockets should be held.

The correct valve timing at ·012 in. tappet clearance is as follows:

Standard and de Luxe models:

Exhaust opens	...	75° before B.D.C.
Exhaust closes	...	35° after T.D.C.
Inlet opens ...	...	30° before T.D.C.
Inlet closes ...	...	60° after B.D.C.

Sports model:

Exhaust opens	...	83° before B.D.C.
Exhaust closes	...	35° after T.D.C.
Inlet opens ...	...	30° before T.D.C.
Inlet closes ...	...	60° after B.D.C.

3. Tappet Adjustment

The tappet clearance is adjusted by means of a screw in the outer end of the rocker. Access to the adjusting screws is obtained by removing the covers of the rocker boxes.

The clearance between the end of the screw on the valve stem cap should be nil, or as little as possible, with the engine **COLD**, for all Meteor Minors, and for continuous high-speed work with the Sports model a clearance of ·005 in. is recommended on the exhaust valves.

To adjust the clearance, loosen the locknut beneath the rocker arm, turn the screw with a small spanner and retighten the locknut.

The adjustment for each valve should be made with the corresponding valve of the other cylinder fully open. This ensures that the tappet is well clear of the ramp which is located on either side of the cam to reduce valve noise.

If, after long service, the valve stem cap or the rocker adjusting screw are found to be worn, they should be renewed, as uneven thrust due to the screw being in a different position after adjustment may cause lateral movement of the rocker giving rise to a sharp tapping noise.

4. Ignition Timing

Before setting the timing, remove the cover and rotor arm of the distributor and adjust the contact breaker points to a clearance of ·015 in. when fully opened. If the contacts are worn or pitted refer to Section G.

Because of the auto-advance mechanism, the timing is normally in the "retard" position when the engine is stationary, and the timing is set so

that firing occurs when the piston is $\frac{1}{32}$ in. before top dead centre, which is equivalent to $\frac{3}{8}$ in. to $\frac{7}{16}$ in. when fully advanced.

To set the ignition timing, put the gearbox in top gear and turn the engine by means of the back wheel until the left-hand piston is $\frac{1}{32}$ in. before top dead centre on the compression stroke, i.e., with both valves closed. The position of the piston can be determined by means of a wire or rod inserted in the sparking plug hole. Slacken the clamp bolt which holds the distributor body to the housing at the back of the timing cover and turn the distributor body until the contact points are just opening, then retighten the clamp bolt.

Check the timing again and also the maximum opening of the points and check that the rotor arm, when replaced, points towards the segments connected to the left-hand sparking plug lead.

There are several methods of determining the point at which the contacts open:

(1) Switch on the ignition. Looking on the left side of the engine, rotate the cam in a clockwise direction (or the housing in a counter-clockwise direction) until the warning light in the ammeter lights up or until the ammeter needle indicates a discharge. Continue to rotate the cam (or housing) slowly until the warning light goes out or until the ammeter needle returns to zero, indicating that the points have opened.

(2) Remove the sparking plug cap from the lead and tuck the lead between the fins of the cylinder. Rotate the cam (or housing) and a spark will be seen at the instant the points open.

(3) Insert a piece of thin tissue paper between the points of the contact breaker and turn the cam (or housing) until the paper can just be pulled out.

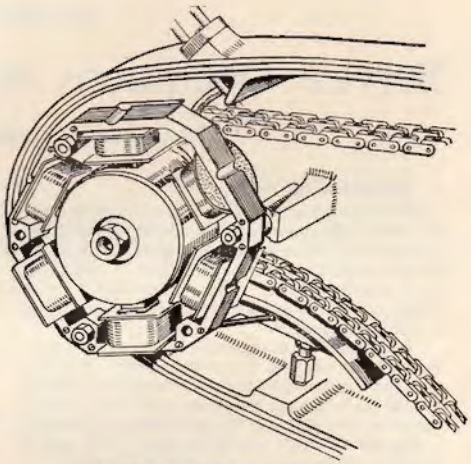
If the timing drive has been dismantled or the distributor removed for any reason, turn the engine until the left-hand piston is $\frac{1}{32}$ in. before top dead centre on the compression stroke and clamp the distributor housing so that the name on it is roughly horizontal.

Replace the chain with the cam in such a position that the contacts are just opening (or as near as possible to this position) with the rotor arm, if replaced, pointing towards the lead to the left-hand sparking plug.

Make the final adjustment by slackening the clamp bolt and rotating the distributor body as described above.

5. Primary Chain Adjustment

The tension of the primary chain can be checked through the inspection cover in the primary chaincase and, should it require adjustment, access to the adjuster is gained by removing the chaincase cover, which is held in position by a single nut.



PRIMARY CHAIN ADJUSTMENT
Fig. 1

Before removing the nut, place a tray under the engine to catch the oil from the chaincase.

Beneath the bottom run of the chain is a curved slipper on which the chain rests and which may be raised or lowered by turning the adjusting screw after having first slackened the locknut.

A rubber button is fitted to the end of the adjusting screw to prevent the transmission of chain noise to the chaincase and this is held against the chaincase by a hairpin spring, which prevents it from bouncing.

Do not adjust the chain to be dead tight but rotate the engine slowly and, while doing so, test the tension of the top run of the chain by pressing it up and down with the fingers. Adjust the tension so that there is $\frac{1}{4}$ in. up and down movement at the tightest spot.

Retighten the locknut on the adjusting screw, replace the chain cover and replenish with oil.

6. Timing Chain Adjustment

Before adjusting the tension of the timing chain turn the engine until the chain is in its tightest position, checking the chain between all sprockets.

Adjust the tension so that there is $\frac{1}{4}$ in. movement of the chain.

The tension of the timing chain is altered by moving the quadrant after slackening the nut A which secures it (see Fig. 2). This rotates the eccentric spindle on which the chain tensioner

jockey sprocket is mounted. Tightening of the chain is effected by moving the quadrant to the left.

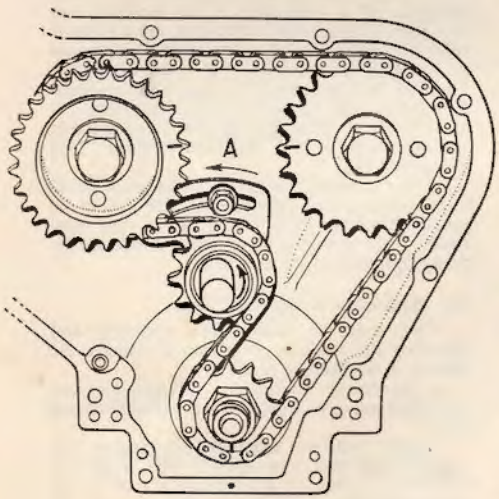
It is imperative that the quadrant is fitted the right way round and that the eccentric spindle is fitted correctly in the quadrant fork. If the chain tightens when the quadrant is moved to the right, the tensioner has been wrongly assembled and may cause damage to the quadrant (see Fig. 3).

In making the adjustment, care must be taken to see that any backlash in the quadrant is taken up in the "tightening" direction, i.e. do not make the chain too tight and then move the quadrant back slightly, but tighten the chain progressively until the correct tension is obtained and then lock the quadrant. If the chain becomes too tight during adjustment, slacken it right back and make the adjustment again.

If the chain is too slack it may give rise to a loud noise which can be mistaken for a faulty bearing. If it is too tight the result will be a high pitched howl. If such noises are heard, therefore, first check the adjustment of the timing chain.

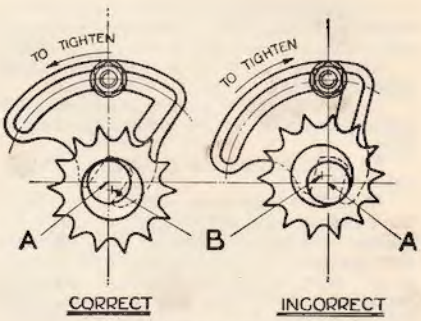
7. Distributor Chain Adjustment

To adjust the distributor chain tension, remove the timing cover (see Subsection 1), slacken the three distributor fixing bolts, slide the distributor back until the chain has about $\frac{3}{16}$ in. up and down movement, then tighten the fixing bolts.



TIMING CHAIN ADJUSTMENT SHOWING TIMING MARKS

Fig. 2



TIMING CHAIN ADJUSTMENT

Fig. 3

8. Removal of the Dual Seat and Rear Mudguard

Disconnect the leads to the rear lamp by pulling out the plugs in the connectors near the tool box.

Loosen the two nuts on either side of the seat attaching the mudguard carrier to the frame and lift the seat, mudguard and carrier off together.

9. Removal of the Petrol Tank

Turn off the petrol tap.

The petrol tank is attached to the frame by a rubber mounted stud at the front, and is clipped at the rear to a rubber sleeve surrounding the top tube. To remove the tank, unscrew one front attachment nut, tap out the stud and, after disconnecting the petrol feed pipe, the rear of the tank can be pulled upwards to release the clip and then lifted clear of the frame.

10. Removal of the Cylinder Head

First remove the petrol tank and petrol pipe (Subsection 9).

The dual seat may also be removed if desired (Subsection 8).

Disconnect the head steady link. (Early models.)

Remove head steady brackets. (Later models.)

Disconnect the oil pipes and plug leads.

Remove the exhaust pipes and carburettor and induction manifold.

Remove the rocker box covers.

Turn the engine until both valves are closed.

Remove the five cylinder head nuts from each head and lift off.

In replacing the heads, see that the dowels are in position in the cylinder barrels and that the push rods are the right way up (shallow cups upwards).

Apply a thin coat of jointing compound to both sides of the gasket and place it in position.

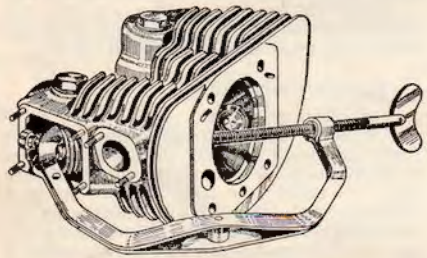
Lower the cylinder heads over the push rods, making sure that the rockers locate in the push rod cups.

Fit the head nuts and washers and partially tighten down.

When both heads have reached this stage, fit the induction pipe and tighten the nuts. The cylinder head nuts can now be finally tightened down progressively and diagonally from one side to the other to prevent distortion. After the engine has been run long enough to get thoroughly hot, the tightness of the nuts should be rechecked.

11. Removal of the Valves

Remove the rocker box covers, each held by four nuts, and swing the rocker clear of the valve. The hardened steel thimbles or end caps, fitted to the valves of Standard and early de Luxe models, must be removed. A tight one may be removed by means of a screwdriver. Later de Luxe and all Sports models do not possess removable end caps.



REMOVAL OF VALVES
Fig. 4

Using a suitable valve spring compressing tool, compress the valve springs and remove the split conical collets from the end of the valve stem. Slacken back the compressing tool and release the springs. Withdraw the valve and place its springs, top spring collar (and bottom collar if it is loose) and split conical collets together in order that they may be reassembled with the valve from which they were removed.

Deal similarly with the other valves in the heads.

If the valve will not slide easily through the valve guide, remove any slight burrs on the end of the valve stem with a carborundum stone. If the burrs are not removed and the valve is forced out, the guide may be damaged.

12. Removal of the Rockers

To remove the rocker, first take off the cylinder head. Remove the hexagon plug on the inner side and the rocker spindle may be drawn out by means of a bolt screwed into the rocker spindle, which is tapped $\frac{5}{16}$ in. B.S.F.

On reassembling make sure that the spring washers are fitted on the sides of the rockers nearest the centre of the engine and the plain thrust washers on the outer sides.

13. Removal of the Valve Guides

To remove the valve guides from the heads two special tools are required which can easily be made.

The first is a piece of tube with an internal bore of not less than $\frac{7}{8}$ in.

The second is a mandrel about 4 in. long made from $\frac{3}{16}$ in. diameter bar with the end turned down to about $\frac{5}{16}$ in. diameter for $\frac{1}{2}$ in.

Support the cylinder head on the tube which fits over the collar of the valve guide. Using the mandrel force the guide out of the head with a hand press or by using a hammer.

To fit a new guide, support the head at the correct angle and use a hand press and the same mandrel. If a hand press is not available and the guide is replaced by a hammer, use a piece of tube of $\frac{3}{16}$ in. internal diameter to prevent damage to the bore of the guide. If a valve guide is removed for any reason, an oversize one should be fitted in order to maintain the interference. It is necessary to recut the valve seat and grind-in the valve after a guide has been replaced. (See Subsection 18.)

A worn exhaust valve guide may give rise to slight smoking from the exhaust pipe due to oil passing down the valve stem on to the hot valve head. This may also be caused or increased by faulty operation of the breather.

14. Removal of the Sparking Plugs

Care must be taken when removing and replacing the sparking plugs not to damage the threads in the cylinder heads.

If the threads do become damaged, they can be tapped out to a larger size and steel wire inserts fitted.

Special tools are available for tapping and inserting the steel wire inserts. The latter tool consists of a piece of $\frac{7}{16}$ in. diameter tube or rod with a slot cut in the end.

The insert is placed over the tool with the tag engaging in the slot and it is screwed into the plug hole in the cylinder head from the outside until the

last coil is 1 to 1½ thread below the top face. A reverse twist of the tool will then break off the tag.

If the cylinder head has been removed, the fitting of the insert will be facilitated if the tool is put through the hole from the inside and the insert screwed back from the outside.

If the cylinder head has not been removed, care must be taken not to drop the end of the tag into the cylinder and in such a case it is better to break off the tag with a pair of long-nosed pliers.

Note: Some engines have short-reach plugs, in which case wire inserts are fitted as standard.

15. Removal of the Cylinders

When the cylinder heads have been removed the cylinders can be lifted clear of the studs. This should be done with the pistons at top dead centre.

It is advisable to put a clean cloth over the mouth of the crankcase to prevent anything, such as a piece of broken piston ring, from falling in.

When replacing the cylinders, clean off the joint faces and fit new paper joints, two to each cylinder.

16. Removal of Pistons

Remove the cylinder heads and cylinders.

With a tang of a file remove the two outer circlips retaining the gudgeon pins. Remove the long central cylinder studs which come opposite the gudgeon pins.

Use Special Tool No. E.5477 to extract the gudgeon pin or using a rod about ¼ in. in diameter insert this right through one gudgeon pin and drive the other pin out of its piston, supporting the connecting rod substantially meanwhile to prevent distortion.

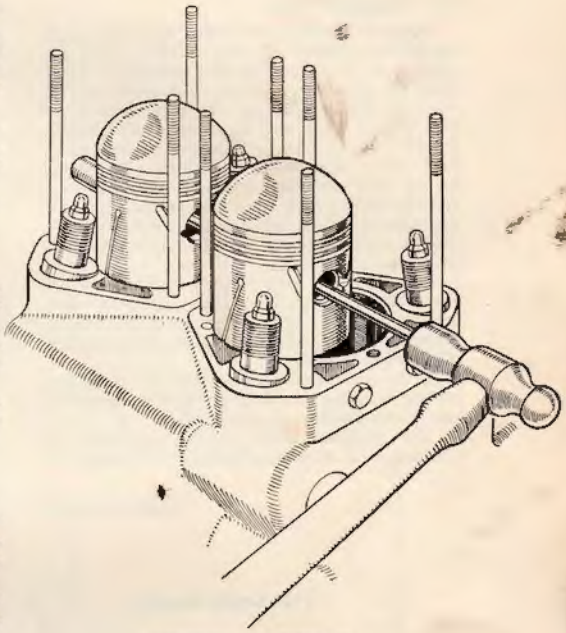
Having lifted the first piston away, the other one may be readily removed in the same manner. Mark the pistons and gudgeon pins so that they go back into the same pistons the same way round and so that the pistons go back into the same barrels the same way round.

Take care not to drop the gudgeon pin circlip into the crankcase. A clean cloth should be put over the mouths of the crankcase to prevent this.

17. Decarbonising

Having removed the cylinder heads as described in Subsection 10, scrape away all carbon, bearing in mind that you are dealing with aluminium which is easily damaged. Scrape gently and avoid scoring the combustion chamber or the valve seats which are of austenitic iron shrunk into the head. Be careful while performing this work not to injure the joint faces which bed down on to the head gaskets.

Do not, in any circumstances, use caustic soda or potash for the removal of carbon from aluminium alloy.



REMOVAL OF PISTONS

Fig. 5

Scrape away all carbon from the valve heads and beneath the heads, being very careful not to cause any damage to the valve faces.

If the piston rings are removed the grooves should be cleaned out and new rings fitted. For cleaning the grooves, a piece of discarded ring thrust into a wooden handle and filed to a chisel point is a useful tool.

If the piston ring gaps exceed $\frac{1}{16}$ in. when the rings are in position in the barrel, new rings should be fitted. The correct gap for new rings is ·011–·015 in. The gap should be measured in the least worn part of the cylinder, which will be found to be the extreme top or bottom of the bore.

While the cylinders and pistons are not in position on the engine, cover the crankcase with a clean cloth to prevent the ingress of dust and dirt of all kinds. Do not, of course, attempt to scrape the carbon from the pistons when the mouths of the crankcase are open.

18. Grinding-in Valves

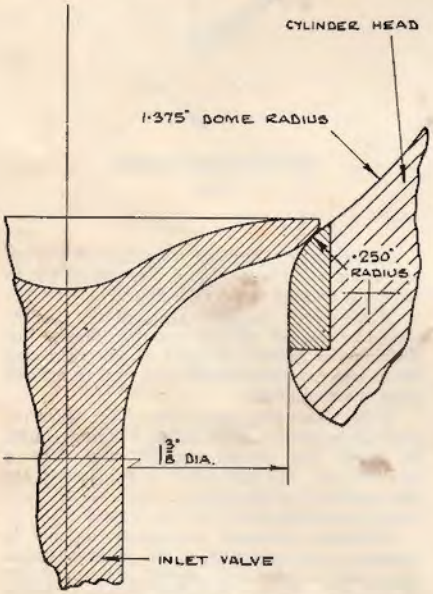
To grind a valve, smear the seating with a little grinding-in compound, place a light, short coil spring over the valve stem and beneath the head, insert the valve into its appropriate guide, press it on to the seat using a tool with a suction cup and with a backwards and forwards rotary motion, grind it on to its seat. Alternatively, a tool which pulls on the valve stem can be used. Frequently lift the valve and move it round so that an even and true seating is obtained. If no light spring is available, the lifting will have to be done by hand. Continue grinding until a bright ring is visible on both valve and seating.

The faces and seats of the exhaust valves are cut at 45 degrees but the profiles of the inlet valves are of a special streamlined design which eliminates pockets and sharp edges and allows a smooth flow of gas without eddies.

If the inlet valves or their seats are pitted and require recutting, care must be taken to reproduce the correct profile as shown in Fig. 6.

The cylinder heads should preferably be returned to the Works for the inlet valve seats to be recut, but, if this is not possible, a special tool consisting of an arbor No. T2053 and cutter No. T2054 is available. Great care must be exercised in using this tool, as it is located off the valve guides and these may be damaged if suitable apparatus is not employed.

The inlet valve faces and seats can be cut at 45 degrees in cases of expediency but this may have a deleterious effect on the performance of the engine.



INLET VALVE SEAT PROFILE
Fig. 6

19. Reassembly after Decarbonising

Before building up the engine, see that all parts are scrupulously clean and place them conveniently to hand on a clean sheet of brown paper.

Check the piston ring gaps to find out whether excessive wear has taken place (see Subsection 17).

It is advisable to fit new gaskets to the cylinder base and cylinder head. Two paper gaskets are fitted to the base of each cylinder.

Smear clean oil over the pistons, having replaced the rings if these have been removed, lower the piston over the connecting rod and insert the gudgeon pin from the outer side. Fit the circlip and then fit the second piston in a similar manner.

Oil the cylinder bores and lower the barrels over the pistons and seat them gently on their gaskets.

Drop the push rods down their tunnels on to the tappet head, shallow cups upwards.

Fit the copper cylinder head gaskets and see that the dowels are in position.

Replace the cylinder heads as described in Subsection 10.

After the engine has been assembled, run it for a brief period at a speed which will ensure that the ignition has been advanced by the automatic advance device. If it is run too slowly "blueing" of the exhaust pipes may take place.

After the engine has been run for some time and has become thoroughly hot, go over **all** the cylinder head and other nuts to ensure that they are tight.

20. Cleaning the Oil Filters

The oil filter is located in the timing cover immediately below the oil pumps and is in the feed circuit to the big ends.

The filter element is removed by unscrewing the nut holding the end cap in position. When reassembling the filter after cleaning, take care that no grit or other foreign matter is sticking to it. The aluminium cylinder fitted over the rod inside the filter element is to reduce the free space which has to be filled after cleaning before oil reaches the big ends. After emptying the filter chamber it is essential to run the engine slowly for about five minutes to ensure that oil is reaching the big ends.

The felt element should be taken out and washed in petrol after the first 500 miles and after every subsequent 2,000 miles. Fit a new element every 5,000 miles.

21. Overhaul of Oil Pumps

Remove the timing cover as described in Subsection 1.

Remove the end plates from both pumps.

Remove the pump discs and plungers.

Remove the pump spindle which can be pulled out from the front or return pump end.

Check the fit of the plungers in the pump discs which should have a minimum of clearance but should be able to be moved in and out by hand.

If, when fitting a new disc or plunger, the plunger is found to be too tight a fit, carefully lap with metal polish until it is just free. If the pump disc is not seating properly or if a new pump disc is being fitted, it should be lapped to the seating with Special Tool No. E.5425, using Carborundum 360 Fine Paste or liquid metal polish until an even grey surface is obtained.

Wash all passages, etc., thoroughly with petrol after lapping to remove all traces of grinding paste.

Check the pump disc springs for fatigue by assembling in the timing cover and placing the pump covers in position. If the springs are correct, the pump cover should be held $\frac{1}{4}$ in. off the timing cover by the feed pump spring and $\frac{1}{8}$ in. off by the return pump spring.

The pump spindle should be renewed if excessive wear has taken place on the teeth.

Reassemble the oil pumps, replacing the paper cover gaskets if necessary. Before fitting each cover fill the pump chamber with clean oil.

Having assembled the pumps, lay the timing cover flat and fill the oil ports by means of an oil-can. Turn the pump spindle with a screwdriver in a clockwise direction looking on the front and it can then be seen whether the pumps are operating correctly.

Fill the filter chamber with clean oil and replace the timing cover, taking great care not to damage the gasket where the section is narrow.

When the timing cover has been refitted on the engine, the oil feed to the big ends can be checked by partially unscrewing the feed plug in the timing cover between the oil pumps. The oil return to the tank can be checked by removing the oil filler cap. The feed to the rockers can be observed by removing the rocker box covers, when oil will be seen flowing down the surface of the push rods.

22. Removal of the Timing Chains

Remove the distributor and chain (Subsection 25).

Loosen the chain tensioner locknut and stud.

Lift the adjusting plate clear of the chain tensioner spindle.

Remove the chain tensioner spindle and sprocket

Lift the chain off the sprockets.

23. Removal of Pump Worm and Timing Sprocket

Remove the timing chains (Subsection 22).

Unscrew the oil pump worm by means of the hexagon head behind it. This is a **Left-Hand Thread.**

Withdraw the timing sprocket using Special Tool No. E.4869.

24. Removal of the Camshaft Sprockets

Remove the timing chains (Subsection 22).

Unscrew the camshaft sprocket fixing bolt, **which has a Left-Hand Thread,** at the same time holding the sprocket.

Withdraw the sprocket by means of a suitable extractor.

25. Removal of the Distributor

Remove the timing cover (Subsection 1).

Remove three fixing screws.

Lift the chain off the sprocket and withdraw the distributor and sprocket complete.

Note that the sprocket is riveted to the shaft and cannot be drawn off in position.

26. Removal of the Engine and Clutch Sprockets

The primary chain is endless so that it is necessary to remove both the engine and clutch sprockets simultaneously.

Remove the alternator stator by undoing three fixing screws.

Remove the central hexagon nut securing the alternator rotor, which can then be drawn off, taking care not to lose the key.

Unscrew the engine sprocket nut using Special Tool No. E.4877. The engine sprocket is mounted on splines and can then be removed with the clutch sprocket.

To remove the clutch sprocket, disconnect the clutch cable, unscrew three pressure plate pins and remove the pressure plate assembly, the centre retaining ring and the assembly of driving and driven clutch plates. The clutch sprocket can then be withdrawn from the centre after the removal of the large circlip which secures it.

When replacing the engine sprocket, take care that the felt washer is not nipped behind the sprocket. This would make the engine very stiff to turn over and would damage the washer and allow leakage from the crankcase.

27. Removal of the Tappets and Guides

It is only necessary to remove the tappets and guides if they have become worn.

Remove the cylinder heads and barrels (Subsections 10 and 15).

Extract the tappet guides, using Special Tool No. E.5790, having heated the case first.

The guides are made from nickel chrome alloy iron and if a guide should break while removing it, it can be withdrawn with a pair of pliers if the crankcase is heated locally with a blowlamp. Otherwise it is necessary to dismantle the crankcase and drive the tappet and guide out from underneath using a heavy bar in the cam tunnel.

The guide should have an interference of ·0015 to ·0025 in. in the crankcase and can be driven in with a bronze drift, care being taken when the guide is nearly home to avoid breaking the collar.

When replacing the exhaust valve tappet guides care must be taken to ensure that the groove in the timing side exhaust guide comes opposite the hole to the timing chest otherwise flooding of the push rod hole in the cylinder will occur causing over-oiling.

If a tappet guide is taken out it should be replaced by an oversize one.

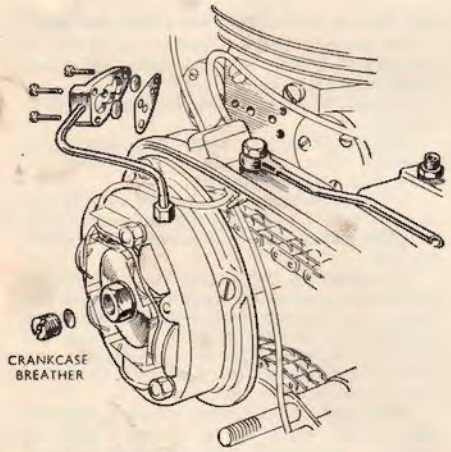
28. Dismantling the Breathers

If the breather is not operating efficiently, it may cause pressure in the crankcase, instead of a partial vacuum, giving rise to smoking or over-oiling.

See that the rubber tube of early models is clean and if it is damaged or distorted, fit a new one.

Ensure that the two discs in the breather housing of later models are not stuck; a paper gasket between the housing backing plate and the crankcase is preferable to jointing compound.

Where fitted, the breather which operates through the end of the crankshaft, may be inspected by removing the slotted plug from the head of the rotor retaining bolt. (See Fig. 7.)



CRANKCASE BREATHER (later models)
Fig. 7

29. Removal of the Clutch

Remove the engine sprocket and clutch sprocket together as described in Subsection 26.

To remove the clutch hub, hold the clutch with Special Tool No. E.4871 and remove the centre retaining nut and washer with a box spanner.

The hub can then be withdrawn from the shaft with Special Tool No. E.5414.

30. Removal of the Final Drive Sprocket

Remove the clutch as described in Subsection 29.

Remove the primary chain tensioner.

Remove the rear half of the primary chaincase by taking out three socket screws.

Remove the grub screw locking the final drive sprocket nut.

Hold the sprocket and remove the nut **(Right-Hand Thread)**. The sprocket can then be withdrawn.

31. Removal of the Engine Bearing Housing Oil Seal

Remove the engine sprocket, clutch and rear half of the primary chaincase.

Early models have a felt washer located in a steel housing at the back of the chaincase. Great care must be taken not to nip the felt washer behind the sprocket on reassembly, as this would make the engine very stiff to turn over, and would damage the washer and allow leakage from the crankcase.

Later models are fitted with a neoprene oil seal located by a shim and washer. This does not entail the risk of nipping, which can be experienced with the early type.

32. Oil Pipe Unions

The oil feed to the rocker gear is through pipes from unions at the back of the crankcase below the cylinder base to unions on the cylinder heads. The unions are fitted with steel wire thread inserts to prevent the threads in the aluminium from stripping.

The method of fitting the thread inserts is the same as that used for the sparking plug inserts described in Subsection 14.

33. Rocker Oil Feed Relief Valve

There is a pressure relief valve in the oil supply to the rocker gear, whose function is to prevent excessive pressure and whose setting is not critical.

The valve is located in the crankcase face behind the timing cover and consists of a $\frac{3}{16}$ in. diameter steel ball held in position by a spring and a brass plug.

The valve is set before leaving the Works and should not normally require to be disturbed but, if it is found necessary to dismantle it, it can be reset by screwing the plug in until it is flush with the face of the crankcase, which will cause the pressure to be relieved at approximately 10 lb./sq. in. The plug is prevented from moving by peening over the aluminium into the screwdriver slot with a small centre punch.

34. Fitting the Alternator

The alternator consists of two parts, the stator and the rotor. The stator of 1960 models is mounted on to the three studs of the adaptor ring, which in turn is secured to the back half of the primary chaincase by three screws.

On earlier models the stator is of greater diameter and mounted on to the primary chaincase with three studs and distance pieces.

The rotor, which contains the permanent magnet, is mounted on the end of the crankshaft and is located by a key and secured by a special bolt and spring washer on 1960 models, and by a nut and tab washer on earlier models.

The radial air gap between the rotor and poles of the stator should be ·020 in. in all positions and care must be taken when refitting to see that it is not less than ·010 in. at any point.

Fit the rotor first, making sure that it is located concentrically on the end of the crankshaft. Attention must be given to the seating of the key because a badly fitting key may cause the rotor to run unevenly. Finally secure the rotor with the appropriate bolt or nut and washer.

Having fitted the rotor, secure the adaptor ring of 1960 models with the three cheese-headed screws, and shakeproof washers, or, in the case of earlier models, place the three distance pieces over the three chaincase studs. The stator may then be fitted, with the coil connections facing outwards, the leads on the inside at 12 o'clock.

Replace the nuts and shakeproof washers only finger-tight, and insert six strips (preferably of non-magnetic material) ·015 in. thick and about $\frac{1}{8}$ in. wide, between the rotor and each pole piece.

Tighten the stator nuts and withdraw the strips.

Check the air gap with narrow feelers and, if less than ·010 in. at any point, remove the stator and file or grind the pole piece carefully until the correct gap is obtained.

An alternative, and more satisfactory method of assembling the alternator requires the use of Special Tool No. T.2055.

This is a gauge ·015 in. greater in radius than the rotor and fits over the adaptor on the end of the crankshaft in the rotor's place.

The stator is then put in position on the studs in the chaincase and the nuts tightened up.

Remove the gauge and fit the rotor, then check the air gap.

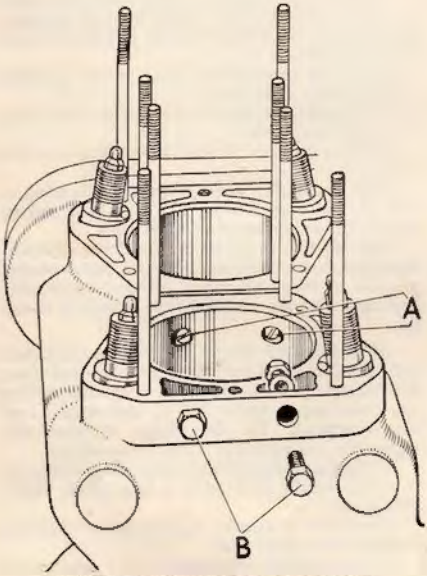
SECTION D11

Service Operations with Engine Removed

"Meteor Minor" Standard, de Luxe and Sports

1. Removal of the Engine Gearbox Unit from the Frame

Disconnect the battery leads.
Remove the dual seat and petrol tank.
Remove the engine steady.
Remove the tool box cover and slide the flexible connection to the air cleaner off the induction pipe.
Remove the exhaust pipe.
Disconnect the electric horn leads.
Disconnect the alternator leads from rectifier and swing the rectifier clear.
Disconnect the distributor low-tension lead.
Remove the slides from the carburettor.
Remove the rear chain.



REMOVAL OF SCREWS IN CRANKCASE
(early models)
Fig. 1

Disconnect the clutch control.
Remove the footrest bar.
Remove the bottom rear engine bolt.
Support the engine on a suitable box or wood block.
Raise the centre stand and remove the spring.
Loosen the bottom gearbox nuts and swing the lower engine plates down.
Remove the front engine plates, horn and stand.
Lift the engine out of the frame.

2. Removal of the Gearbox

Remove the engine sprocket and clutch (Section C, Subsections 26 and 29).
Remove the rear half of the primary chaincase by removing three socket screws and the chain tensioner pivot.
The gearbox can now be withdrawn from the back of the crankcase after unscrewing the four nuts which secure it.

3. Dismantling the Crankcase

Drain the oil tank by removing the drain plug.
Having removed the engine from the frame as described in Subsection 1, dismantle the heads, barrels, pistons, timing gear, magneto, etc., as described in Section C.
Remove the gearbox as described in Subsection 2.
Remove the two hexagon-headed plugs on the driving side of the crankcase just below the cylinder base.
On no account must these plugs be disturbed on early models, unless the driving side cylinder has been, or is to be, lifted, because they cannot be tightened without holding the nuts inside. Later models do not have internal nuts, the holes in the crankcase being tapped and the plugs, which have slotted hexagon heads, screw into them.
Access can now be obtained through the plug holes to two screws holding the two halves of the crankcase together which must be removed.
Remove three nuts in the timing chest, two nuts on the driving side crankcase, two loose studs through the bottom of the crankcase and two loose studs through the back of the oil tank. (The other studs have already been removed to take the engine out of the frame.)

Turn the crankshaft until the connecting rods are at bottom dead centre and the two halves of the crankcase can then be separated, tapping the crankcase with a soft mallet.

The inner race of the roller bearings on the timing side will remain on the crankshaft bringing with it the cage and rollers and leaving the outer race fixed to the crankcase.

The inner race of the ball bearing on the driving side is a tight fit on the shaft and can be removed with Special Tool No. E.5121. If this is not available, the shaft can be driven out with a hide mallet or a soft metal drift.

To avoid damage to the ball bearing the case should be heated to about 100° C. before doing this.

4. Main Bearings

To remove the ball bearing from the driving side crankcase, heat the crankcase to about 100° C. by immersion in hot water or in an oven after which the bearing can be driven out using a drift **which applies pressure to the outside race only.**

When refitting a new ball bearing, heat the crankcase in the same way and use the same drift taking great care to keep the bearing square with the bore.

To remove the outer roller race from the timing side crankcase, first heat the crankcase then drive the race out using a small punch through the three holes provided.

The inner race and rollers can be withdrawn from the crankshaft using a claw type extractor.

When refitting the inner race drive it on to the shaft until just flush with the end and no further.

5. Fitting the Connecting Rods

To remove the connecting rods from the crankshaft, first take out the cotter pins securing the socket screws in the connecting rods and then remove the socket screws themselves.

If the big end bearings caps are removed to examine the condition of the bearings, **make sure that the caps are refitted the same way round on the same rods and that the rods themselves are refitted the same way round on the same crank pins.**

In refitting the connecting rods, the socket screws should be tightened with a torque wrench set at 200–220 in. lb.

If the cotter pins do not come in line remove the socket screws and use a different thickness of washer. A difference of ·005 in. in the washer alters the position of the screw approximately $\frac{1}{8}$ of a turn.

There is a recess in one side of the connecting rod for a cotter pin head and this side must face outwards when the connecting rod is assembled on the crankshaft to avoid fouling between the cotter and the crankshaft web.

If it is necessary to replace the big ends, a service crankshaft can be supplied with connecting rods fitted.

6. Reassembly of the Crankcase

Fit the outer roller race in the timing side crankcase, the ball bearing in the driving side crankcase and the inner roller race on the crankshaft as described in Subsection 4.

Be sure that the inner race is driven on just flush with the end of the crankshaft and no further.

There are several methods of assembling the crankcase. If the timing side is fitted to the crankshaft first, care must be taken not to score the inside of the case. If the driving side is fitted first it is possible, with some makes of roller bearing, though not probable, to drop one of the rollers into the crankcase and cause serious damage to the engine.

(*a*) *Timing Side First.* Heat the timing-side crankcase with the outer roller bearing race in position to about 100° C.

Lay the crankcase flat on the bench and insert the shaft, with the inner roller race in position, arranging the connecting rods so that they do not foul the crankcase.

Insert the camshafts in their correct position (exhaust front, inlet rear).

Put the distance piece in position on the driving side of the crankshaft.

Apply a jointing compound to the timing side crankcase.

Heat the driving side crankcase and bearing to 100° C. and drop it over the crankshaft, **making sure to lift the tappets clear of the cams.**

Bolt the two halves of the crankcase together. The crankshaft should now be drawn into its correct position by fitting the engine sprocket temporarily and tightening the nut whilst the crankcase is still hot.

(*b*) *Driving Side First.* Support the crankshaft with the driving end pointing upwards and place the distance piece in position. Heat the driving side crankcase to about 100° C. and place it over the crankshaft. Fit the engine sprocket and tighten the nut while the crankcase is still hot.

Invert the crankshaft and crankcase and support it on two blocks of wood or a large block with a hole in it.

Insert the camshafts in their correct position (exhaust front, inlet rear).

Apply jointing compound to the driving-side crankcase.

Heat the timing-side crankcase (with the outer roller race) to about 100° C. and drop it over the

crankshaft, **making sure to lift the tappets clear of the cams.**

Bolt the two halves of the crankcase together.

If so desired the heated timing-side crankcase can be supported on a block or blocks as above and the crankshaft dropped into it.

Alternatively, the crankshaft can be supported in a vertical position as above and the crankcase driven on to it (without heating) by means of a tubular drift applied to the inner race of the bearing or the crankcase may be drawn on to the shaft by means of the sprocket nut with a temporary distance piece in place of the sprocket.

7. Crankshaft Plugs

The oil passage through the big ends is sealed by two aluminium plugs driven in at each end and locked by grub screws and pins through the flanges.

It is not normally necessary to remove the plugs but, if it is desired to do so, one must be drilled and tapped and extracted and the other can then be driven out after the grub screws and pins have been removed. Make sure all swarf from drilling is removed from the oil passage.

If the plugs are removed, they must be replaced by new ones.

8. Pump Worm Threads

If the threads in the crankshaft, into which the pump worm screws, become damaged, a steel wire insert can be fitted. The crankshaft should preferably be returned to the Works for this to be done or, alternatively, the hole can be drilled out $\frac{7}{16}$ in. in diameter, using the timing sprocket as a drill bush and new threads tapped with a special tool. **Note that the thread is left-hand.**

The method of fitting the wire insert is the same as described in Section C, Subsection 14, for the sparking plugs.

SECTION E8

Gearbox and Clutch

"Meteor Minor" Standard, de Luxe and Sports

1. Description of the Clutch

The clutch is built into the clutch sprocket and is mounted on the gearbox mainshaft which projects through into the primary chaincase.

There are five driven plates which are plain and four driving plates, giving eight friction surfaces.

The driven plates comprise the clutch centre backplate, three plain plates on splines on the clutch centre and the clutch cover plate.

The driving plates comprise the clutch sprocket itself which has a fabric ring rivetted to each side and three pierced plates which rotate with it and which are fitted with Klingerite inserts on early models.

Later models have the first plate in order of assembly fitted with Klingerite inserts and the outer two bonded-on friction material.

The clutch plates are held in contact, when driving, by six coil springs and are released when the springs are compressed by the clutch operating mechanism.

The clutch operating mechanism consists of a torque arm which is held stationary by a stud in the chaincase and an operating lever on the same centre which is rotated relatively to the torque arm, with a scissor-like movement, by the clutch cable connected to the clutch lever on the handlebar. Between the operating lever and the torque arm are four $\frac{1}{4}$ in. dia. steel balls in recesses so that, when the levers are rotated relatively to each other, the balls are forced out of the recesses forcing the levers apart and thus compressing the clutch springs.

2. Description of the Gearbox

The operation of the gearbox is shown diagrammatically in Fig. 2.

The clutch sprocket A is mounted on the end of the mainshaft B which passes through the mainshaft sleeve C on the end of which is the final drive sprocket D.

At the other end of the mainshaft B is a pinion E which engages with a pinion F on the layshaft G. At the other end of the layshaft G is a pinion H engaging with a pinion J which runs free on the mainshaft sleeve C.

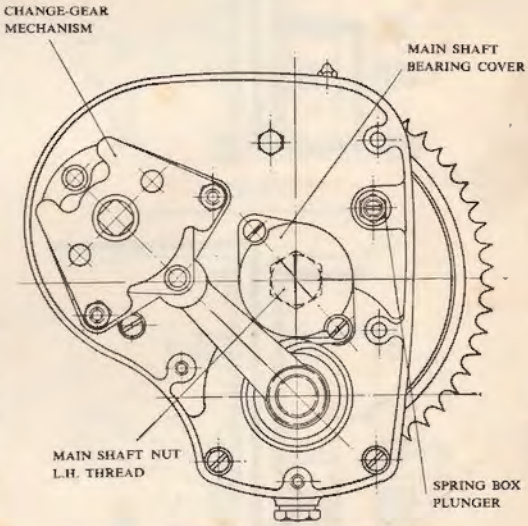
The mainshaft sleeve C has splines on which slides a double pinion KL. This double pinion KL engages with two pinions M and N which are free to rotate or slide on the layshaft G.

The double pinion KL has dogs at each end which can engage with dogs on the pinion E or on the pinion J.

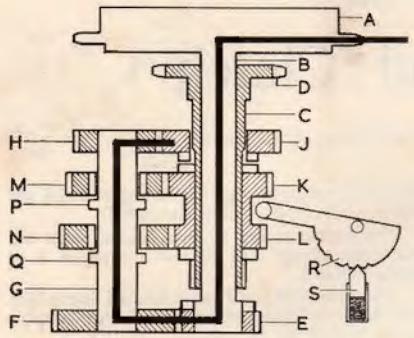
The pinions M and N have internal dogs which can engage or slide over projecting dogs P and Q on the layshaft G.

The double pinion KL and the pinions M and N all slide together and are moved by the operator fork R and are located by a spring plunger S which engages with a notched plate which is part of the operator arm R.

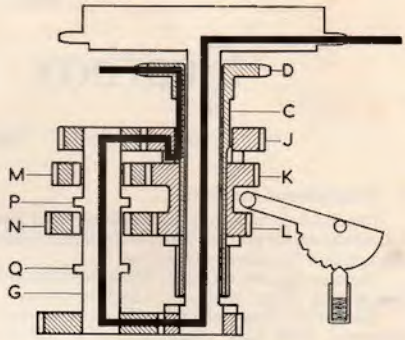
The kickstart lever is connected to the pinion F on the layshaft by a ratchet mechanism which automatically disengages when the lever is released.



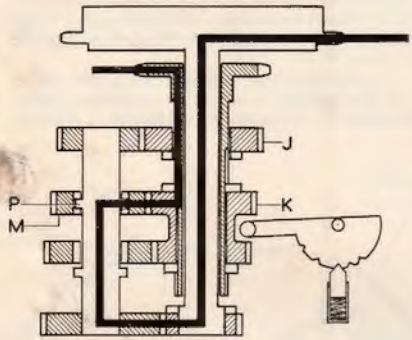
GEARBOX WITH OUTER COVER REMOVED
Fig. 1



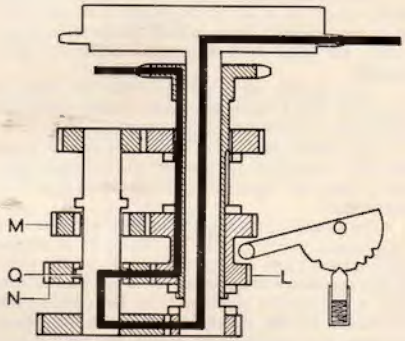
(A) NEUTRAL



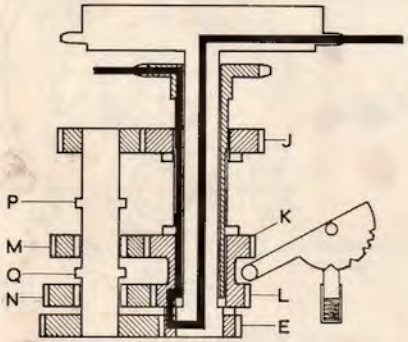
(B) FIRST GEAR



(C) SECOND GEAR



(D) THIRD GEAR



(E) TOP GEAR

Fig. 2A—Neutral. None of the dogs is engaged so that the mainshaft B and pinions E, F, H, J are rotating but the mainshaft sleeve C and the final drive sprocket are stationary.

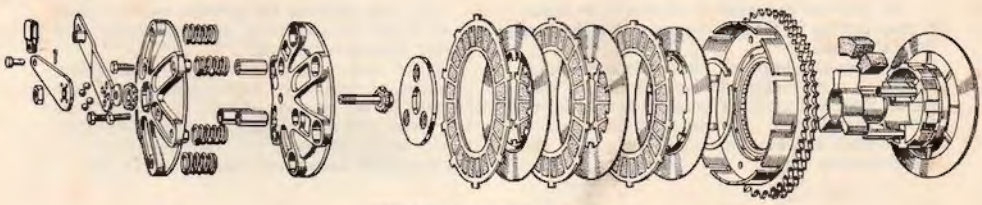
Fig. 2B—Bottom Gear. The sliding pinions K, L, M, N have moved over so that the dogs on K engage with the dogs on the pinion J. This causes the double pinion KL, the mainshaft sleeve C and the sprocket D to rotate with the pinion J which is being driven from the mainshaft through the layshaft G. The dogs P and Q are not engaged.

Fig. 2C—Second Gear. The sliding pinions have moved so that the dogs on J are disengaged but the dogs P on the layshaft engage with the pinion M. The drive from the mainshaft and layshaft then passes through pinions M and K to the splines on the mainshaft sleeve and the pinion J is free on the sleeve.

Fig. 2D—Third Gear. The sliding pinions have moved further over so that the dogs Q on the layshaft engage with the pinion N which drives the pinion L and thus the mainshaft sleeve, the pinion M being free on the layshaft.

Fig. 2E—Top Gear. The sliding pinions have now moved right over so that both sets of dogs P and Q on the layshaft have disengaged but the dogs on the double pinion KL have engaged with those on the pinion E and the mainshaft and sleeve rotate together giving a one to one drive through the gearbox from the clutch sprocket to the output sprocket, the pinions M, N, J being free to rotate.

OPERATION OF GEARS
Fig. 2



EXPLODED VIEW OF CLUTCH
Fig. 3

3. Removal of the Gearbox

This is described in Section D, Subsection 2.

The gearbox can, however, be completely dismantled with the engine in the frame except for the removal of the inside operator and the bearings in the gearbox shell.

4. To Dismantle the Gearbox

First remove the kickstart crank, the change-gear lever and the neutral finder and pointer.

Remove four screws and the gearbox outer cover can then be detached.

Remove the change-gear mechanism by taking off the two nuts securing it.

Remove the mainshaft bearing cover which is attached by two screws.

Remove four cheese-headed screws and one hexagon bolt.

Remove the spring box locating plunger nut and washer.

Remove the mainshaft nut **(Left-Hand Thread).**

The gearbox inner cover can then be removed.

The mainshaft can be drawn straight out if the clutch has been removed, which, however, should be done before taking off the gearbox inner cover. (See Section C.) The top gear pinion and dog will come away with the mainshaft.

The layshaft can then be removed and the 2nd and 3rd gears drawn off the final drive sleeve together with the operator fork.

To take out the final drive sleeve, the final drive sprocket must be removed and this is preferably done before removing the inner cover. (See Section C.)

5. Removal of the Ball Races

The mainshaft ball bearings can be removed by using a stepped drift $1\frac{7}{16}$–$1\frac{1}{64}$ in. diameter for the bearing in the box and $\frac{13}{16}$–$\frac{3}{64}$ in. diameter for the bearing in the cover.

When refitting the bearings stepped drifts of $2\frac{9}{16}$–$1\frac{1}{64}$ in. diameter and $1\frac{11}{16}$–$\frac{3}{64}$ in. diameter must be used for the bearings in the box and cover respectively.

Note the felt washer in the recess behind the larger mainshaft bearing and the dished pen-steel washer between the bearing and the felt washer. The second dished pen-steel washer, if fitted, has a smaller central hole and is on the other side of the mainshaft bearing and is nipped between the inner face of the bearing and the shoulder on the final drive sleeve. See that both of the dished pen-steel washers have their raised portions facing towards the clutch and final drive sprockets.

6. Change-Gear Mechanism

If the two nuts securing the change-gear ratchet mechanism are slackened the adjuster plate can be set in the correct position. In this position the movement of the gear lever necessary to engage the ratchet teeth will be approximately the same in each direction.

If the plate is incorrectly adjusted, it may be found that, after moving from top to third or from bottom to second gear, the outer ratchets do not engage the teeth on the inner ratchets correctly.

If, when fitting new parts, it is found that the gears do not engage properly, ascertain whether a little more movement is required or whether there is too much movement so that the gear slips right through second or third gear into neutral. If more movement is required, this can be obtained by filing the adjuster plate very slightly at the points of contact with the pegs on the ratchet ring.

If too much movement is already present, a new adjuster plate giving less movement must be fitted.

7. Reassembling the Gearbox

The procedure is the reverse of that given in Subsection 4, but the following points should be noted:—

If the mainshaft top gear pinion and dog have been removed, make sure that the dog is replaced the right way round or third and top gears can be engaged simultaneously.

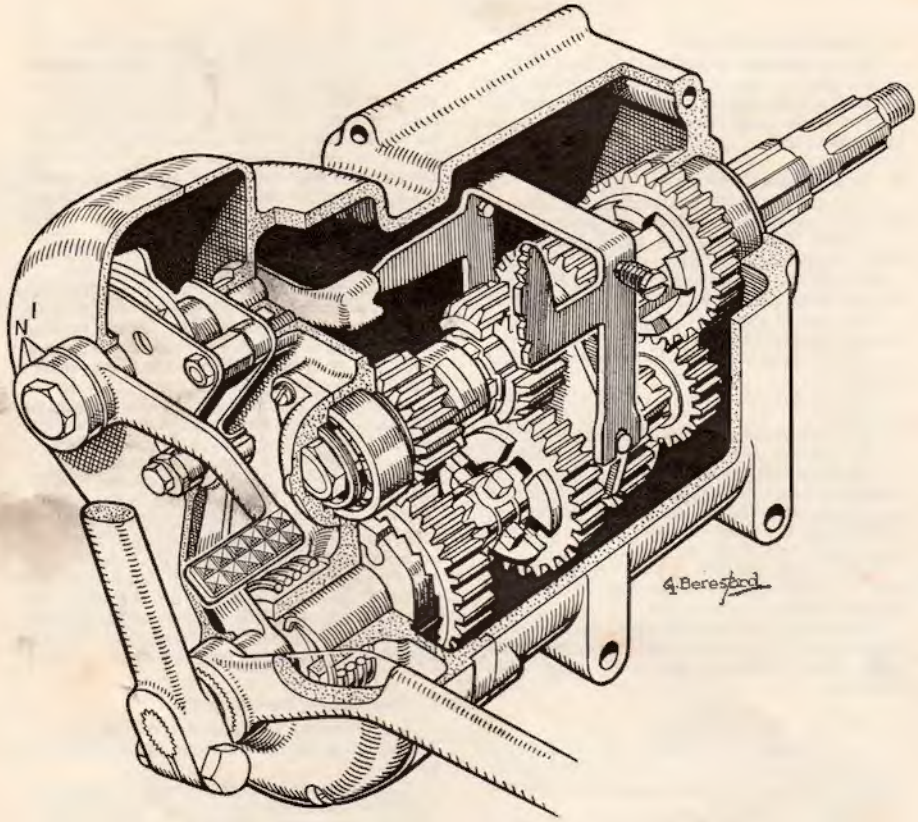
Make sure that the trunnions on the operator fork engage with the slots in the inside operator.

See that the mainshaft is pushed right home. It may tighten in the felt washer inside the final drive shaft nut.

The layshaft top gear and kickstarter pinion should be assembled on the layshaft and the kickstarter shaft and ratchet assembled on to it before fitting the end cover. Do not forget the washer on the layshaft between the kickstarter pinion and the kickstarter shaft.

The joint between the gearbox and the inner cover should be made with gold size, shellac or a similar jointing compound.

Make sure that all parts are clean before commencing assembly. In normal climates the recesses in the gearbox should be packed with soft grease and the box should be filled up to the correct level with engine oil. (See Subsection 11.) **On no account must heavy yellow grease be used.**



CUTAWAY SECTION OF GEARBOX
Fig. 4

8. Dismantling and Reassembling of the Clutch

The method of removing the clutch is described in Section C.

When reassembling, note that the two outer steel plates are dished, the centre one being flat. The correct order of assembly is shown on the exploded drawing.

Do not forget to replace the cush rubbers, retaining plate, and three distance tubes, before fitting the pressure plate assembly.

When reassembling the pressure and outer plates, see that the three distance tubes are fitted over the pins securing the outer plate to the clutch centre and that the six springs are correctly positioned between the two plates.

Tighten the three pressure plate pins as far as they will go.

If the clutch lifts unevenly it is probable that one of the springs has taken a set, in which case new springs should be fitted.

9. Adjustment of Clutch

As with any other type of friction clutch, correct adjustment of the control is essential if the clutch is to transmit torque without slip and to free correctly when lifted. Two points of adjustment are provided—one in the clutch operating mechanism itself and the other in the clutch control cable. The adjustment in the clutch control mechanism must be adjusted so that the end of the operating lever has about $\frac{1}{32}$ in. free movement. To do this first make sure that there is plenty of slack in the control cable (or disconnect it from the handlebar lever) then loosen the central locknut and rotate the pressure plate withdrawing pin by means of the screwdriver slot in its end. Turning this pin clockwise will increase the clearance in the operating mechanism; turning it anti-clockwise will take up the clearance. Lock up the locknut and check that there is still clearance in the operating mechanism. This can conveniently be done by means of a screwdriver in the slot in the end of the pressure plate withdrawing pin.

Surplus slack in the control cable can now be taken up by means of a mid-cable adjuster which should be adjusted so that there is about $\frac{1}{16}$ in. free movement on the cable and securely locked in this position.

(1) If the adjustment in the clutch operating mechanism is incorrectly adjusted so that there is no free movement of the pressure plate withdrawing pin, the clutch will slip even if plenty of clearance is given to the control cable.

(2) If excessive clearance is given either in the operating mechanism or in the control cable the clutch will drag when lifted.

(3) If excessive clearance is given in the operating mechanism and this is taken up by adjusting the control cable, it will be found that the top of the clutch operating lever knuckle will bear against the under side of the cable stop formed on the torque arm before the handlebar lever comes against the rubber grip. This will limit the movement of the clutch, which will drag when lifted.

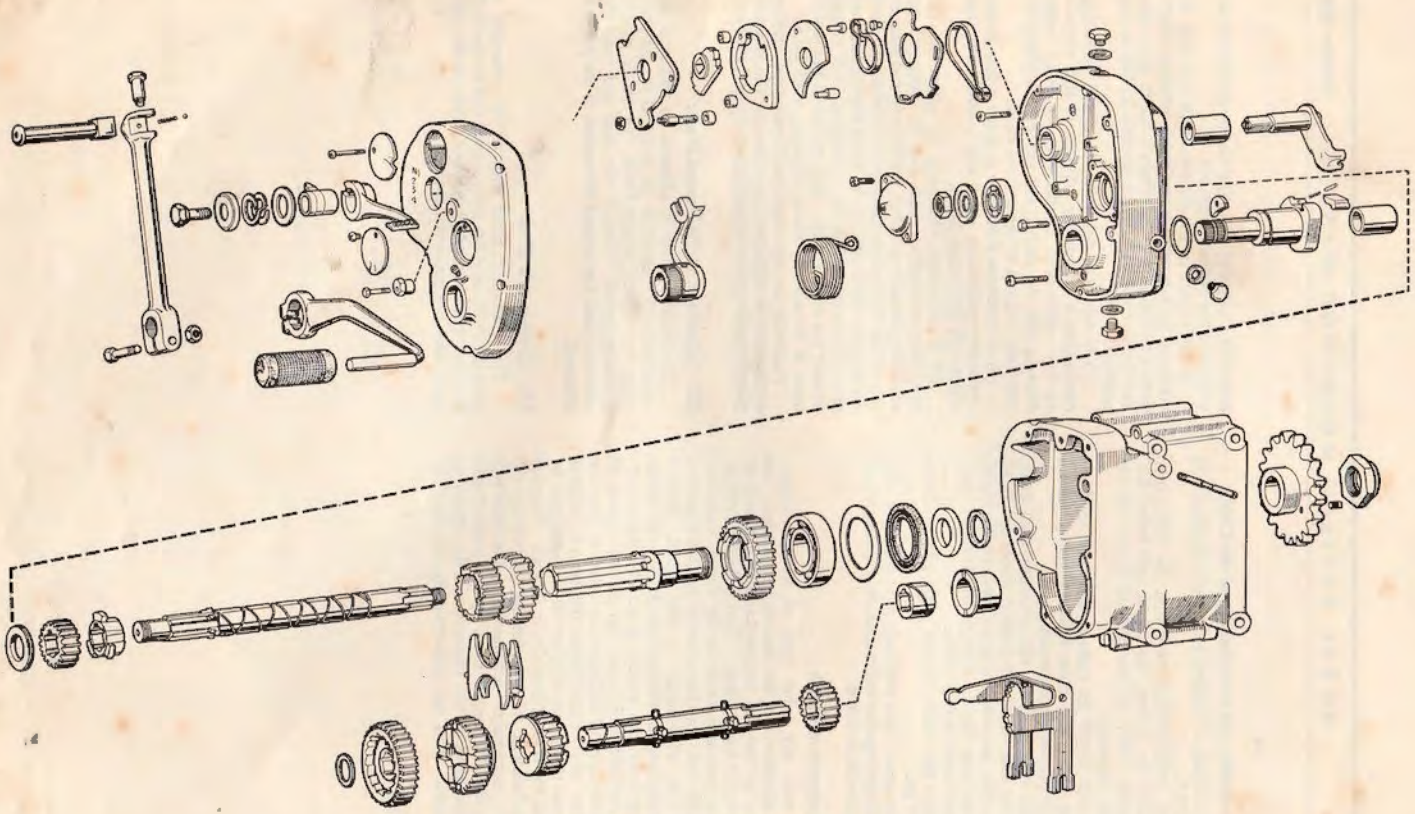
Access to the adjustment on the clutch operating mechanism is obtained by removing the screwed plug from the centre of the primary chaincase cover.

10. Adjustment of the Neutral Finder

The neutral finder is adjusted by means of an eccentric stop secured to the front of the gearbox cover by a bolt which limits the travel of the operating pedal. Slacken the bolt and turn the eccentric until the correct movement of the pedal is obtained.

11. Gearbox Oil Level

The gearbox is filled with oil by removing a plug in the top and the correct level can be checked by removing a second plug lower down on the left-hand side looking at the cover.



EXPLODED VIEW OF GEARBOX
Fig. 5

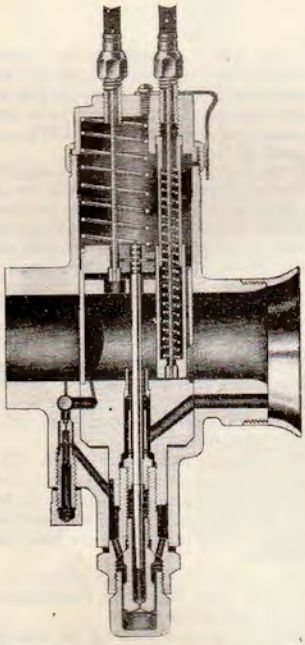
SECTION F4

Amal Monobloc Carburetter

1. General Description

The Amal Monobloc Carburetter has been introduced as an improvement on the earlier standard needle type. In general it gives better petrol consumption, combined with improved starting and acceleration from low speeds and a small increase in maximum speed.

The float chamber is integral with the mixing chamber and contains a pivoted barrel-shaped float operating on a nylon fuel needle. There is a considerable leverage ratio between the float and the needle and, in consequence, flooding is rare unless there is dirt on the needle seating.



SECTION THROUGH MIXING CHAMBER, SHOWING AIR VALVE AND THROTTLE CLOSED

Fig. 1

The supply of air to the engine is controlled by a throttle slide which carries a taper needle operating in the needle jet. The needle is secured to the throttle slide by a spring clip fitting in one of five grooves and the mixture strength throughout a large proportion of the throttle range is controlled by the position of this needle in the slide and by the size of the jet in which it works. There is, however, a restricting or main jet at the bottom of the needle jet and the size of this controls the mixture strength at the largest throttle openings. At very small throttle openings petrol and air are fed to the engine through a separate pilot system, which has an outlet at the engine side of the throttle. The air supply to this pilot system is controlled by the pilot air screw and the slow running of the engine can be adjusted by means of this screw and a stop which holds the throttle open a very small amount. The throttle slide is cut away at the back and the shape of this cut-away controls the mixture at throttle openings slightly wider than that required for slow running. There is a compensating system to prevent undue enriching of the mixture with increasing engine speed, this system consisting of a primary choke surrounding the upper end of the needle jet through which air is drawn in increasing quantities as the depression in the main choke increases. This air supply and the supply to the pilot system are taken from two separate ducts in the main air intake to the carburetter so that all the air passing to the engine can be filtered by fitting an air cleaner to the main carburetter air intake.

Two small cross holes in the needle jet, at a level just below the static level in the float chamber, permit petrol to flow into the primary choke when the engine is not running or when it is running at very low speeds, thus forming a well of petrol which will be drawn into the engine on starting or accelerating from low speeds. At moderately high engine speeds the level of petrol in the float chamber falls slightly and in consequence no more fuel flows through the cross holes in the needle jet so that the petrol well remains empty until the engine slows down or stops.

A handlebar controlled air slide is provided to enrich the mixture temporarily when required.

2. Tuning the Carburetter(s)

The throttle opening at which each tuning point is most effective is shown in Fig. 2. It should be remembered, however, that a change of setting at

any point will have some effect on the setting required at other points; for instance, a change of main jet will have some effect on the mixture strength at half throttle which, however, is mainly controlled by the needle position. Similarly an alteration to the throttle cut-away may affect both the needle position required and the adjustment of the pilot air screw. For this reason it is necessary to tune the carburetter in a definite sequence, which is as follows:

First—Main Jet. The size should be chosen which gives maximum speed at full throttle with the air control wide open. If two different sizes of jet give the same speed the larger should be chosen for safety as it is dangerous to run with too weak a mixture at full throttle.

Second—The pilot air screw should be set to give good idling. Note that the pilot jet is detachable and two sizes are available, 25 c.c. and 30 c.c. If the pilot air adjusting screw requires to be screwed out less than half a turn the larger size pilot jet should be used; if the air screw requires to be screwed out more than 2-3 turns fit the smaller size of pilot jet.

PHASES OF AMAL MONOBLOC CARBURETTER THROTTLE OPENINGS

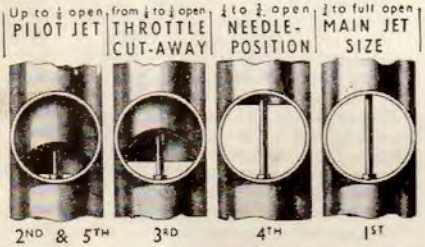


Fig. 2

Third—the throttle valve should be selected with the largest amount of cut-away which will prevent spitting or misfiring when opening the throttle slowly from the idling position.

Fourth—The lowest position of the taper needle should be found consistent with good acceleration with the air slide wide open.

Fifth—The pilot air screw should be checked to improve the idling if possible. When setting the adjustment of the pilot air screw this should be done in conjunction with the throttle stop. Note that the correct setting of the air screw is the one which gives the fastest idling speed for a given position of the throttle stop. If the idling speed is then undesirably fast it can be slowed down by unscrewing the throttle stop a fraction of a turn.

It will be noted that of the four points at which adjustments are normally made, i.e., pilot air screw, throttle cut-away, needle position and main jet size, the first and third do not require changing of any parts of the carburetter. Assuming that the carburetter has the standard setting to suit the particular type of engine any small adjustments occasioned by atmospheric conditions, changes in quality of fuel, etc., can usually be covered by adjustment of the pilot air screw and raising or lowering the taper needle one notch. If, however, the machine is used at very high altitudes or with a very restricted air cleaner a smaller main jet will be necessary. The following table gives the reduction in main jet size required at different altitudes:

Altitude, ft.	Reduction, %
3,000	5
6,000	9
9,000	13
12,000	17

In the case of carburetters for engine running on alcohol fuel considerably larger jets are needed. In most cases a No. 113 needle jet will be required and the main jet size will require to be increased by an amount varying from 50% to 150% according to the grade of fuel used.

If the engine is run on fuel containing a small proportion of alcohol added to the petrol, a rough and ready guide is that the main jet should be increased by 1% for every 1% of alcohol in the fuel. In most cases alcohol blends available from petrol pumps do not contain sufficient alcohol to require any alteration to the carburetter setting.

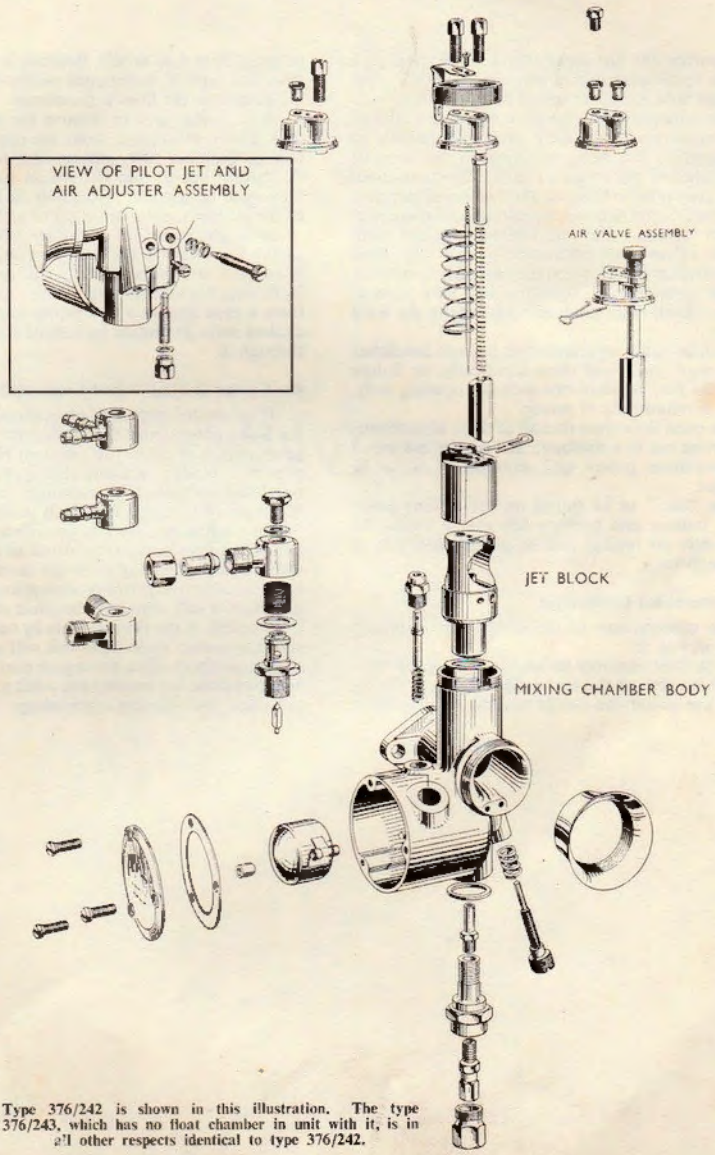
The range of adjustment of the taper needle and the pilot air screw are determined by the size of the needle jet and of the pilot outlet respectively. Standard needle jets have a bore at the smallest point of ·1065 in. and are marked 106. Alternative needle jets ·1055 in., ·1075 in., ·109 in. and ·113 in. bore are available and are marked 105, 107, 109 and 113 respectively.

The standard pilot outlet bore is ·025 in. but in some cases larger size pilot outlets are used. Since the pilot outlet is actually drilled in the body of the carburetter it is necessary to have a carburetter with the correct size pilot outlet if the best results are to be obtained.

The accompanying table shows the standard settings for Amal Monobloc Carburetters used on Royal Enfield motor cycles.

Both instruments used for the twin carburetter "Constellation" are identical in all respects but for the float chamber arrangement, which is as follows:

Carburetter type 376/242 supplies the left-hand cylinder and has an integral float chamber which



Type 376/242 is shown in this illustration. The type 376/243, which has no float chamber in unit with it, is in all other respects identical to type 376/242.

Fig. 3

also controls the fuel supply via a connecting pipe to the right-hand instrument type 376/243; this does not have a float chamber in unit with it.

It is important that the pilot air screws of both carburetters are in identical positions, relative to one another, the same applying to the throttle valves when seated on their stops. This is essential for an even smooth tickover and low-speed running. The speed of the tickover is regulated by these four adjuster screws. For an instant pick-up, both throttle valves must commence to rise from their stops simultaneously, when the twist grip is rotated. This is obtained by adjusting the twin control cables. Each main jet needle must be in the third groove.

Both air slides, operated from a single handlebar lever, must open and close identically, as failure to do this may result in one slide not opening fully, with a resultant loss of power.

It is most important that all of these adjustments are carried out in a thorough and careful manner if the maximum power and smoothness is to be obtained.

The "ears" to be found on the leading edges of the battery and toolbox lids are to shield the carburetter air intakes and so prevent misfiring at maximum revs.

3. Dismantling Carburetter

The construction of the carburetter is clearly shown in Fig. 3.

If the float chamber floods, first make sure that there is no dirt on the fuel needle seating. Owing to the use of a nylon needle and the leverage ratio between float and needle, flooding is very unlikely with this type of carburetter unless dirt is present or, of course, the float is punctured.

If it is necessary to remove the jet block note that this is withdrawn from the upper end of the mixing chamber after unscrewing the jet holder. Be careful not to damage the jet block when removing or refitting it. Note that the large diameter of the jet block pulls down on to a thin washer.

A single strand of an inner control cable is useful for clearing the small passages in the jet block and care must be taken not to enlarge these by forcing the wire through them. Compressed air from a pipe line or a tyre pump is preferable. A choked main jet should be cleared only by blowing through it.

4. Causes of High Petrol Consumption

If the petrol consumption is excessive first look for leaks either from the carburetter, petrol pipe, petrol tap(s) or tank. If coloured petrol is in use this will readily indicate the presence of any small leaks which otherwise might pass unnoticed. If the petrol system is free from leaks, carefully set the pilot adjusting screw as described in Subsection 2 to give the correct mixture when idling. Running with the pilot adjusting screw too far in is a common cause of excessive petrol consumption. If the consumption is still heavy try the effect of lowering the taper needle in the throttle slide by one notch. Do not fit a smaller main jet as this will not affect consumption except when driving on nearly full throttle and may make the mixture too weak at large throttle openings, thus causing overheating.

Settings for AMAL carburetters on ROYAL ENFIELD motor cycles

Machine	Carburetter Type No.	Choke Bore in.	Main Jet c.c.	Needle Jet	Needle Position	Throttle Valve	Pilot Jet c.c.
"250 Clipper" 1955 (late), 1956, 1957 and 1958 (early)	375/10	22/32	120	105	3	375/060/4	25
"Crusader 250" 1957 onwards **"250 Clipper"** 1958 (late) and 1959 onwards	375/16	7/8	120	105	3	375/060/3½	25
"Crusader Sports" 1959 onwards and **"250 Trials"** 1962 onwards	376/216	15/16	150	106	3	376/060/3½	25
"Crusader" Super 5" 1962 onwards	376/283	1	170	106	3	376/3½	25
"350 Bullet" 1955 (late), 1956–7–8 and **"350 Clipper"** 1958 onwards	376/29	1	180	106	3	376/060/4	30
"350 Bullet" 1959 onwards	376/215	1 1/16	190	106	3	376/060/4	30
"Works Replica" 1958 onwards	376/29	1	180	106	3	376/060/4	30
"500 Bullet" 1956–58	389/9	1⅛	200	106	2	389/060/3½	30
"500 Bullet" 1959 onwards	389/34	1 1/16	*220	106	3	389/060/3½	30
"Meteor Minor" 1958 onwards	376/92	1 1/16	250	106	2	376/060/3½	30
"Meteor Minor Sports" 1960 onwards	376/92	1 1/16	250	106	2	376/060/3½	30
"Super Meteor" 1956 onwards	376/41	1 1/16	240	106	3	376/060/3½	30
"Constellation" 1960 onwards	L/hand 376/242 R/hand 376/243	1 1/16	320	106	3	376/060/4	25

* With Air Cleaner. Main Jet 250 without Air Cleaner.

SECTION G2j

Lucas A.C. Lighting-Ignition System

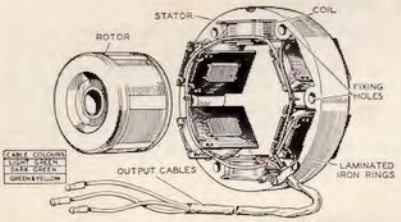
Used on 1960 "Meteor Minor Sports," 1958/60 "Meteor Minor de Luxe" and 1958-59 "Meteor Minor Standard"

1. General

The Lucas A.C. Lighting-Ignition System comprises seven main components :

(1) Alternator with magnet rotor.
(2) Bridge-connected rectifier.
(3) Ignition coil.
(4) Distributor with automatic timing control.
(5) Lighting switch.
(6) Ignition switch.
(7) 6-volt battery (see Section G4a).

Under normal running conditions, electrical energy in the form of rectified A.C. passes through the battery from the alternator, the rate of charge depending on the position of the lighting switch. When no lights are in use, the alternator output is sufficient only to trickle charge the battery. When the lighting switch is turned to the "Pilot" or "Head" positions the current increases proportionately.



STATOR AND ROTOR OF ALTERNATOR RM15
Fig. 1

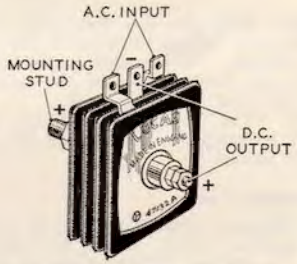
2. Alternator Models RM14 and RM15

Early models are fitted with type RM14 alternator, which has an outside diameter of 5⅛ in. Later models are fitted with type RM15 (see Fig. 1) with an outside diameter of 5 in. They give a high output at low r.p.m. The alternator comprises two main components, a stator and a rotor. The stator is built up from iron laminations and carries three pairs of series-connected coils insulated from the laminations. The rotor has a hexagonal steel core, each face of which carries a permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to brass side plates, the assembly being cast in aluminium and machined to give a smooth external finish. The stator and rotor can be separated without the need to fit magnetic keepers to the rotor poles.

As the rotor turns, rapid and repeated reversals of flux take place in the coil cores. These lines cut through the turns of the coil and induce alternating voltages in that coil. External connections are taken to these coils from a bridge-connected rectifier (see Fig. 2).

3. Circuit Detail

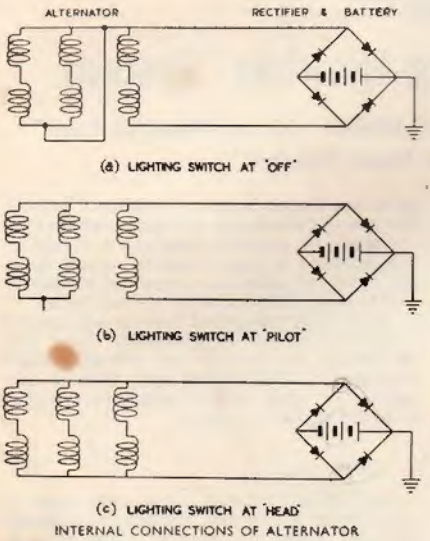
The alternator stator carries three pairs of series connected coils, one pair being permanently connected across the rectifier bridge network. The purpose of this latter pair is to provide some degree of charging current for the battery whenever the engine is running.



GENERAL VIEW OF RECTIFIER
Fig. 2

Connections to the remaining coils vary according to the position of the lighting and ignition switch controls, as shown schematically in Fig. 3.

When no lights are in use the alternator output is regulated to its minimum value by interaction of the rotor flux and the flux set up by current flowing in the short-circuited coils.



CIRCUIT DIAGRAMS FOR POSITIONS OF LIGHTING SWITCH

Fig. 3

In the "Pilot" position these coils are disconnected and the regulating fluxes are consequently reduced. The alternator output therefore increases and compensates for the additional parking light load.

In the "Head" position the alternator output is further increased by connecting all three pairs of coils in parallel.

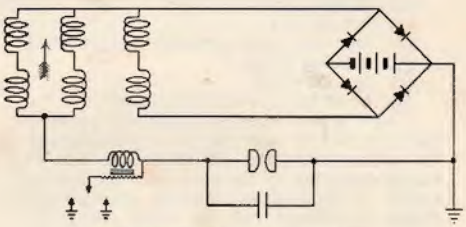
4. Emergency Starting

An emergency starting position is provided on the ignition switch. This is for use if the battery has become discharged and a normal start cannot be made. In the switch position "EMG" four coils of the alternator are connected through one arm of the rectifier to the primary winding of the ignition coil, with the contact breaker in series.

This system, which on a single cylinder machine could cause trouble through unwanted sparks on the compression stroke of the engine, does not do so on the twin, owing to the fact that the distributor permits the passage of a spark only when the engine is near the firing position.

To ensure easy starting in the "EMG" position of the switch, the stator and rotor poles of the A.C. generator must be correctly positioned. This is ensured by: (*a*) fitting the rotor sleeve so that the keyway is at the top when the engine is at T.D.C.; (*b*) seeing that the key is correctly fitted; (*c*) fitting the stator so that the leads enter it at the top, at the **back** of the stator, and (*d*) timing the contact breaker correctly, i.e., so that the points are just about open when the pistons are $\frac{1}{32}$ in. before T.D.C.

After starting on the "EMG" position, the switch should be returned to the "IGN" position.



EMERGENCY STARTING CIRCUIT

Fig. 4

5. Direct Operation

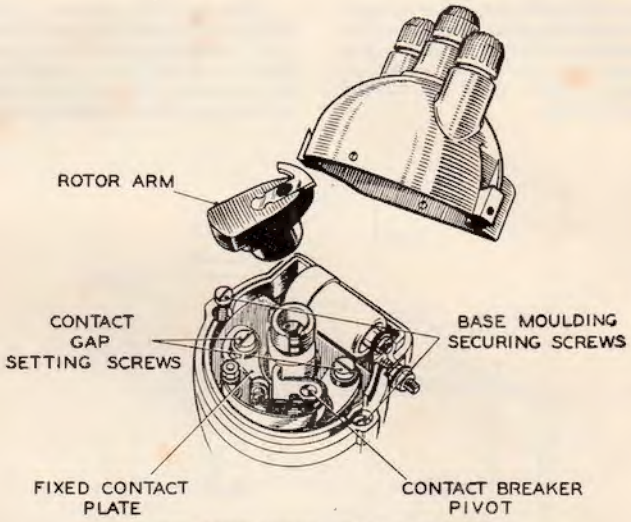
Short journeys without the battery can be made with the switch in the "EMG" position. To do this, the cable normally connected to the battery negative terminal must be connected to an earthed point on the machine. If lights are required when the battery is disconnected, use only the headlights and keep the engine speed low to prevent excessive voltage rise.

6. Routine Maintenance

The alternator and rectifier require no maintenance apart from ensuring that all connections are clean and tight.

If the rotor, stator, engine crankshaft or rear half of the chaincase have been disturbed, the air gap between the rotor and stator should be checked. If a feeler gauge of at least ·008 in. thick cannot be passed between the rotor and each of the stator poles the alignment should be checked.

The nuts which clamp together the rectifier plate assembly must not under any circumstances be slackened. They have been carefully set during manufacture to give correct rectifier performance. A separate nut is used to secure the rectifier to the frame of the motor cycle.



DISTRIBUTOR MODEL DKX2A (early models)
Fig. 5

7. Ignition Coil Model Q6 or MA6

The ignition coil should be kept clean and the terminals kept tight.

8. Distributor

Early Models: Type DKX2A.
Later Models: Type Lucas 18D2.

Lubrication every 3,000 miles. No grease or oil must be allowed to get on or near the contacts when carrying out the following procedure.

Smear the surface of the cam very lightly with Ragosine Molybdenised non-creep oil or clean engine oil.

Place a spot of Ragosine oil or clean engine oil on the contact breaker pivot.

Automatic Timing Control. To obtain access to this lift off the rotor arm and unscrew the two screws securing the contact breaker base plate to the distributor. Lubricate the automatic timing control, thus exposed, with Ragosine Molybdenised non-creep oil, or clean engine oil, paying particular attention to the pivots. Refit the base plate and rotor arm.

Cleaning every 6,000 miles. Remove and clean the cover paying particular attention to the spaces between the metal electrodes and check that the small carbon brush moves freely in its holder.

Examine the contact breaker, the contacts must be free from grease or oil. If they are burnt or blackened, clean with fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a clean petrol-moistened cloth. Cleaning of the contacts is made easier if the lever carrying the moving contact is removed.

Contact Breaker Setting. The contact breaker setting should be checked after the first 500 miles running and subsequently every 6,000 miles. To check the gap, turn the engine over slowly until the contacts are seen to be fully open and insert a 0·014—0·016 in. feeler gauge between the contacts.

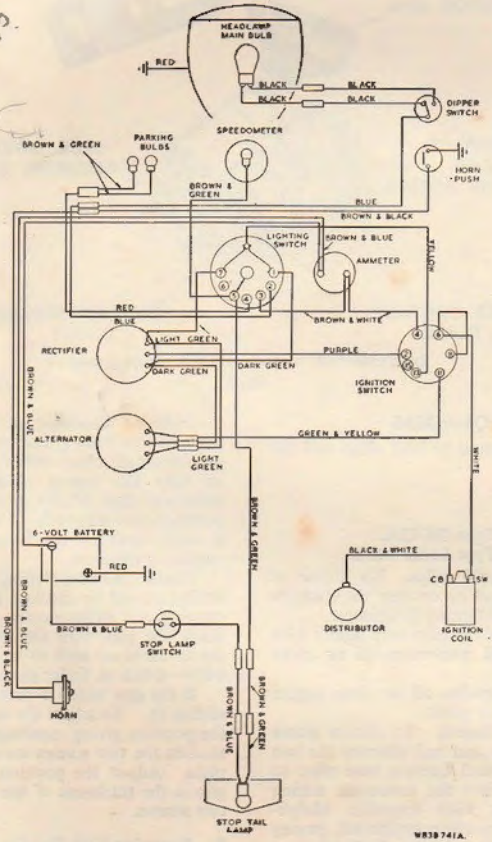
If the gap width is correct the gauge will be a sliding fit. To adjust the setting, set the engine in the position giving maximum contact opening and slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is the thickness of the gauge and tighten the two screws.

9. Renewing High Tension Cables

If any of the high tension cables show signs of perishing or cracking they must be replaced, using 7 mm. neoprene-covered rubber ignition cable. To connect the cable to the distributor or to ignition coil model Q6, remove the metal washer

and moulded terminal nut from the defective cable. Thread the new cable through the moulded terminal nut and cut back the insulation for about $\frac{1}{4}$ in. Pass the exposed strands through the metal washer and bend them back radially. Screw the terminal into the pick-up moulding.

To connect the cable to ignition coil model MA6, pass the cable through the rubber grommet, push the metal clip into the end of the cable (which should be cut off square), insert the cable and clip into the socket in the end of the coil, and slide the grommet into place to exclude water.



WIRING DIAGRAM

Fig. 6

SECTION G4a

Battery Model PUZ7E

1. General

The model PUZ7E (see Fig. 1) is a "dry-charged" battery and is supplied without electrolyte but with its plates in a charged condition. When the battery is required for service it is only necessary to fill each cell with sulphuric acid of the correct specific gravity. No initial charging is required, but the battery must be left to stand at least one hour after filling before putting the machine into service and then adjusting the acid level if necessary.

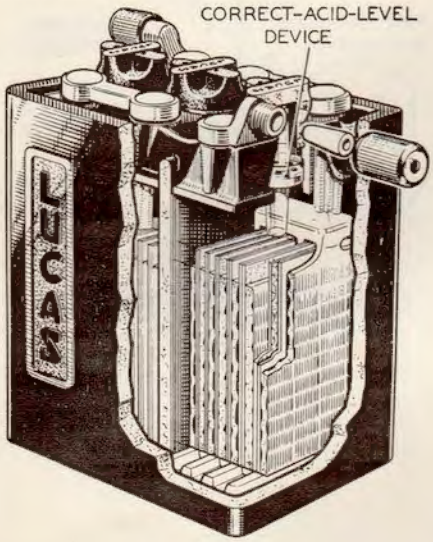


Fig. 1

2. Preparation for Service

The electrolyte is prepared by mixing together distilled water and concentrated sulphuric acid, using lead-lined tanks or suitable glass or earthenware vessels. Slowly add the acid to the water, stirring with a glass rod. Never add water to the acid, as this causes dangerous spurting of the concentrated acid. The specific gravity of the filling electrolyte depends on the climate in which the battery is to be used.

Specific gravity of electrolyte for filling "dry-charged" batteries :

Climates below 90°F. (32°C.)	Climates above 90°F. (32°C.)
Filling, 1·270	Filling, 1·210

The approximate proportions of acid and water to obtain these specific gravities :

To obtain specific gravity (corrected to 60°F.) of :	Add 1 vol. of 1·835 S.G. acid (corrected to 60°F.) to :
1·270	2·9 vols. of water.
1·210	4·0 vols. of water.

Heat is produced by the mixture of acid and water, the electrolyte should be allowed to cool before pouring it into the battery.

The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60° F., which is adopted as a reference temperature.

The method of correction is as follows :—

For every 5°F. below 60°F., deduct ·002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F. add ·002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature.

Fill the cells to the tops of the separators, *in one operation.* The battery filled in this way is 90% charged. When time permits, a short freshening charge for no more than four hours at the normal recharge rate of 1·5 amp. should be made.

3. Routine Maintenance

Fortnightly (or more frequently in hot climates) examine the level of electrolyte in the cells and if necessary add distilled water to bring the level up to the tops of the separators. The use of a Lucas Battery Filler will be found helpful, as it ensures that the correct electrolyte level is automatically maintained and also prevents distilled water from being spilled on the top of the battery (see Fig. 2).

Occasionally examine the terminals, clean and coat them with petroleum jelly. Wipe away all

Fig. 2

dirt and moisture from the top of the battery and ensure that the connections are clean and tight.

4. Servicing

If the battery is subjected to long periods of night parking with the lights on, without suitable opportunities for recharging, a low state of charge is to be expected.

Measure the specific gravity of the acid of each cell in turn with a hydrometer (see Fig. 3).

The following table shows the state of charge at different values of specific gravities :

State of Charge	Temperature under 90°F.	Temperature over 90°F.
Battery fully charged ...	1·270—1·290	1·210—1·230
Battery about half charged ...	1·190—1·210	1·130—1·150
Battery fully discharged ...	1·110—1·130	1·050—1·070

If the battery is discharged, it must be recharged, either on the motor cycle by a period of daytime running or from an external D.C. supply at the normal recharge rate of, 1·5 amp.

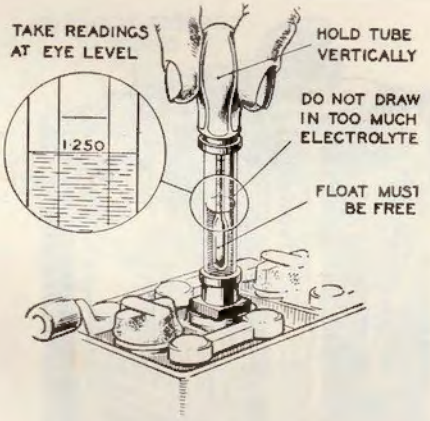


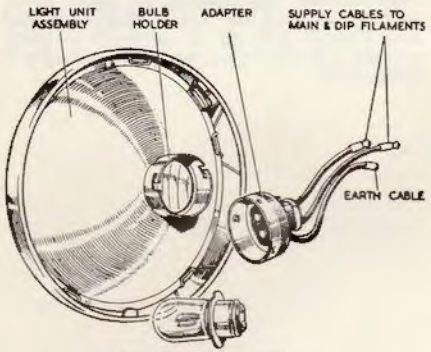
Fig. 3

SECTION G5d

Head and Tail Lamps

1. Headlamp

In all the above Models the headlamp incorporates the Lucas Light Unit MCF700. This is built into the Casquette fork head which contains twin parking lamps as well as the ammeter and switch.



HEADLAMP MCF700
Fig. 1

2. Lucas Light Unit

The unit incorporates a combined reflector and front lens assembly (see Fig. 1). This construction ensures that the reflector and lenses are permanently protected, thus the unit keeps its high efficiency over a long period. A "prefocus" bulb is used, the filaments of which are accurately positioned with respect to the reflector, thus no focusing device is necessary.

The bulb has a large cap and a flange, which has been accurately positioned with relation to the bulb filaments during manufacture. A slot in the flange engages with a projection on the inside of the bulb holder positioned at the back of the reflector.

A bayonet-fitting adaptor with spring-loaded contacts secures the bulb firmly in position and carries the supply to the bulb contacts.

The outer surface of the lens is smooth to facilitate cleaning. The inner surface is formed of a series of lenses which determine the spread and pattern of the light beams.

In the event of damage to either the lens or reflector a replacement light unit must be fitted.

3. Replacing the Light Unit and Bulb

Slacken the securing screw at the top of the headlamp rim. Remove the front rim and Light Unit assembly.

Withdraw the adaptor from the Light Unit by twisting it in an anti-clockwise direction and pulling it off. Remove the bulb from its locating sleeve at the rear of the reflector.

Disengage the Light Unit securing springs from the rim and lift out the Light Unit.

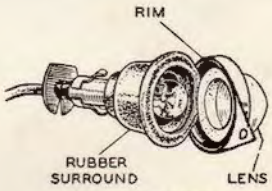
Position the new unit in the rim so that the word "TOP" on the lens is correctly located when the assembly is mounted on the headlamp. Refit the securing springs ensuring that they are equally spaced around the rim.

Replace the bulb and adaptor. The bulb must be the Lucas "prefocus" type—6 v. 30/24 watt Lucas No. 312.

Locate the bottom of the Light Unit and front rim assembly in the headlamp shell or in the fixing rim attached to the Casquette fork head. Press the front on and tighten the securing screw at the top of the headlamp.

4. Parking Lights

Access to the parking bulbs is obtained by removing the parking lamp rim (see Fig. 2). This is forced over the edge of the rubber lamp body and is additionally secured by means of a small fixing



PARKING LIGHT
Fig. 2

screw. After removal of the lamp rim the parking lamp lens can be pulled out of the rubber body, after which the bulb will be accessible.

5. Tail Light

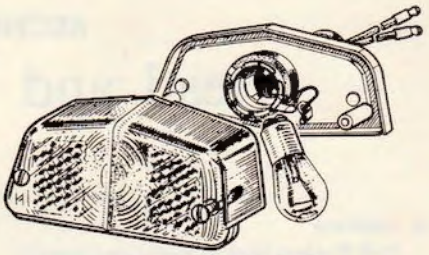
The Lucas lamp, Type 564 (Fig. 3) is a combined stop and tail light and also incorporates a reflector.

Access to the bulb is obtained by removing the two screws which secure the plastic cover.

The correct bulb is Lucas No. 384 6 volt 6/18 watt. The 6 watt filament provides the normal tail light, while the 18 watt filament is illuminated on movement of the brake pedal.

(**Note.**—6 watt bulbs are now required by law in Great Britain on machines of more than 250 c.c. capacity.)

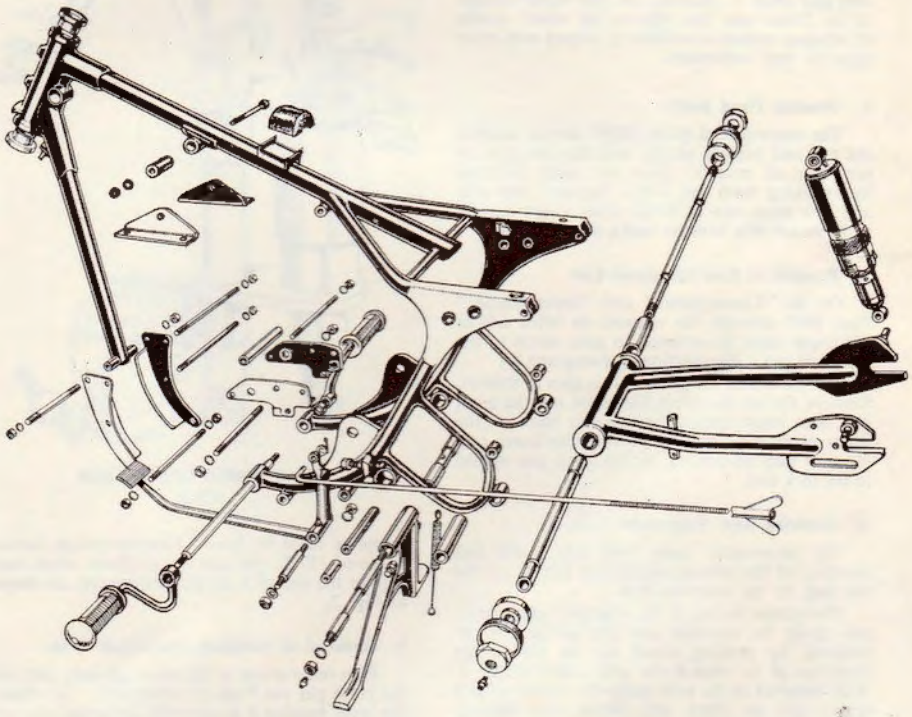
Care must be taken that the leads to the stop tail lamp are correctly connected, as the use of the 18 watt filament on the normal tail light will not only discharge the battery but could cause trouble from excessive heat affecting the plastic cover. At the same time, the 6 watt filament, if used as a stop-tail light, will be ineffective in bright sunlight or at night when the tail light filament is illuminated.



STOP-TAIL LAMP L.564
Fig. 3

SECTION H5

Frame



EXPLODED VIEW OF "CONSTELLATION" FRAME

Fig. 1

1. Description of Frame

The frame is built throughout of cold drawn weldless steel tubing with brazed or welded joints, liners being fitted where necessary for extra strength. All the main frame members are made of chrome-molybdenum alloy steel tubing which retains its strength and resistance to fatigue after brazing or welding.

The swinging arm unit which forms the chain stays is fitted with large diameter phosphor bronze bushes and pivots on a stout steel tube which is secured to the main frame by a long bolt passing through the pivot lugs. Hardened steel thrust washers are provided to deal with side thrust. The torsional rigidity of the swinging arm unit helps to maintain the rear wheel upright in the frame and thus relieves the wheel spindle of bending stresses to which it is subject with other types of rear suspension.

2. Steering Head Races

The steering head races, 34085, are the same at the top and bottom of the head lug and are the same for all models. They are easily removed by knocking them out with a hammer and drift and new races can be fitted either under a press or by means of a hammer and a wooden drift.

3. Removal of Rear Suspension Unit

On the "Constellation" and "Super Meteor" from 1961 onwards, the valances on either side of the frame must be removed to gain access to the top pivot pin. (See Section C, paragraph 8.)

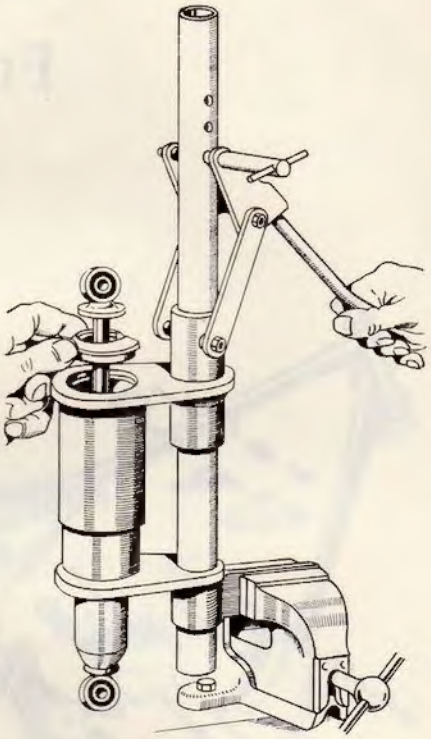
The procedure for all models is then as follows. Remove the top pivot pin nut, drive out the pivot pin, then hinge the suspension unit back on the lower pivot pin. After removing the lower nut, the unit may be pushed off the pivot pin welded to the fork end.

4. Servicing Rear Suspension Units

The proprietary units fitted are sealed and servicing of the internal mechanism can be carried out only by the manufacturers.

The rubber bushes in the top and bottom eyes can easily be renewed and the spring can be removed by pushing down on the top spring cover so as to release the split collar above it. After removal of the split collar the top cover and spring can be lifted off. When reassembling, the spring should be greased to prevent rust and squeaking if it should come into contact with either of the covers.

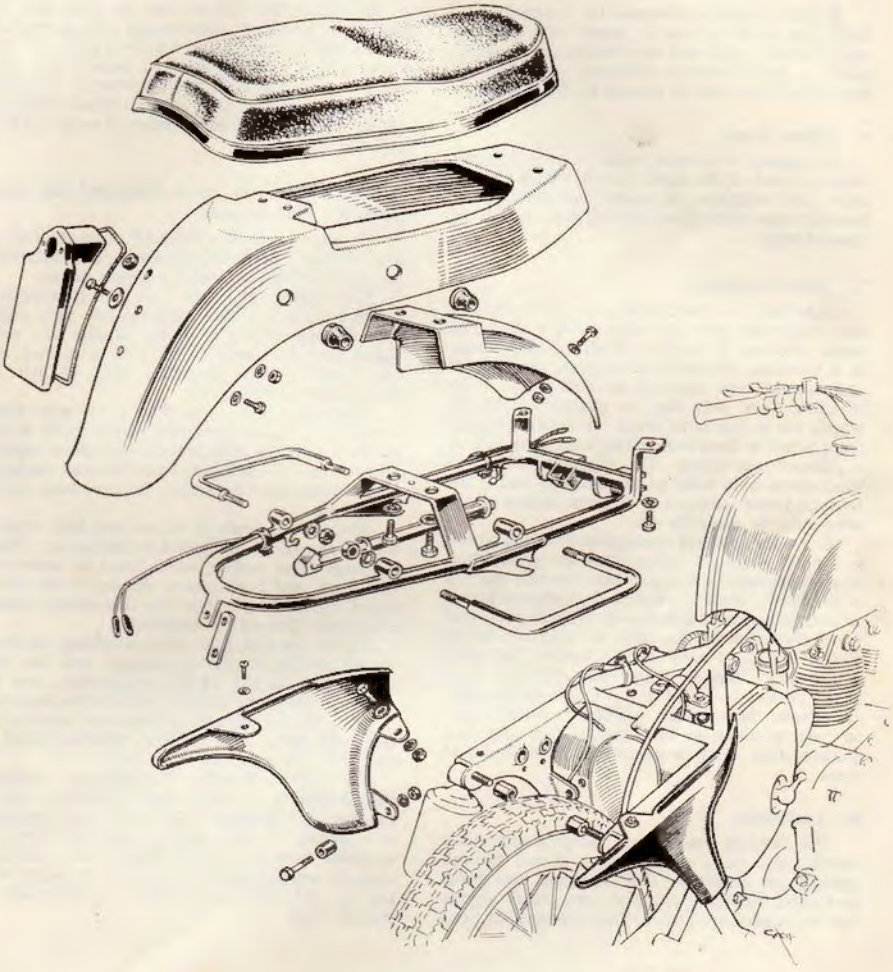
The standard solo springs have a rate of 100—105 lb. per inch and it is not difficult to compress these by hand. Heavier springs having a rate of 130 lb. per inch are available which may require the use of a spring compressor, as shown in Fig. 2.



REAR SPRING COMPRESSOR
Fig. 2

5. Removal of Swinging Arm Chain Stays

First remove one of the pivot pin nuts and pull the pivot pin out from the other end. To release the pivot bearing it is necessary to spread the rear portion of the frame, using the frame expander E.5431, which will spread the frame sufficiently to enable the spigots on the thrust washers to clear the recesses in the pivot lugs forming part of the frame.



DUAL SEAT—MUDGUARD ASSEMBLY "CONSTELLATION" AND "SUPER METEOR," 1961 ONWARDS

Fig. 3

If it is necessary to remove the bronze bushes these can be driven out by means of a hammer and a suitable drift and new bushes can be fitted under a press without difficulty. After fitting the bushes they must be reamed to ·844/·843 in.

6. Centre Stand

To remove the centre stand unscrew the nut from one end of the stand spindle, knock out the latter and withdraw the stand complete with its bearing sleeve after disconnecting one end of the stand spring.

7. Wheel Alignment

Note that it is not possible to guarantee that the wheels are correctly aligned when the same notch position is used on both adjuster cams. It is therefore not sufficient to count the notches and use the same position on both sides of the machine. The only way to guarantee that the wheels are in line is to check the alignment from front wheel to back using either a straight edge or a piece of taut string. The alignment should be checked on both sides of the machine and if the front and rear tyres are of different section allowance must be made for this.

It is usual to check the alignment of the wheels at a point about six inches above the ground but, if the alignment is checked also towards the top of the wheels, it will be possible to ascertain whether or not the frame is twisted so as to cause one wheel to be leaning while the other is vertical. To do this it is always necessary to remove the mudguards and, unless a straight edge cut away in its centre portion is available, it will be necessary also to remove the cylinder, toolboxes, battery, etc., in order to allow an unbroken straight edge or a piece of taut string to contact the front and rear tyres.

8. Lubrication

The steering head races, swinging arm pivot bearing and stand pivot bearing should be well greased on assembly. The swinging arm pivot and stand pivot are provided with grease nipples but no nipples are provided for the steering head as experience has shown that the provision of nipples at this point causes trouble through chafing and cutting of control and lighting cables. If the steering head bearings are well packed they will last for several years or many thousands of miles.

Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C.3 or Shell Retinax A.

9. Dismantling the Rear Mudguard-dual Seat Assembly, 1961 onwards

Having removed the assembly from the frame, as described in Section C, paragraph 8, dismantling for repair or replacement is a simple matter.

First remove the single $\frac{3}{16}$ in. bolt securing the number plate, and disconnect the rear light wires at the junctions. The lifting handles are next pulled out, after undoing the two $\frac{5}{16}$ in. nuts on each handle. The grommets may be left in position in the mudguard.

Take out the two $\frac{3}{16}$ in. bolts in the nose of the mudguard. These screw into tapped holes in the dual seat. When replacing, the shakeproof washer must be next to the head of the bolt and the large plain washer must be against the underside of the mudguard.

Remove the single $\frac{3}{16}$ in. nut and bolt, attaching the rear of the mudguard to the carrier. Note the large plain washer, which must be under the bolt head, and bear against the top of the mudguard on assembly. Also the shakeproof washer and metal plate on the underside.

Lastly, the two $\frac{1}{4}$ in. bolts attaching the front of the carrier to the mudguard, and the two $\frac{5}{16}$ in. bolts in the carrier bridge piece, can be undone. They fit into tapped holes in the dual seat.

Note that shakeproof washers are fitted to all bolts and studs. Plain washers must be placed as described above and shown in Fig. 3.

On some early 1961 "Constellation" models, this mudguard is made from glass-fibre and in the event of damage small repair kits, consisting of a quantity of resin, catalyst and glass fibre, are available from our Service Department. Instructions for carrying out minor repairs are issued with this kit. All other models have the mudguard of pressed steel.

SECTION J6

Front Fork

With Casquette and Aluminium Alloy Bottom Tubes

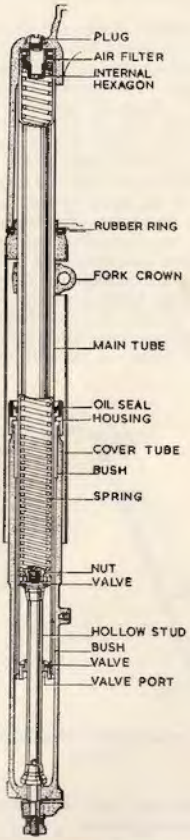
1. Description

The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is screwed into the Casquette fork head at the upper end and securely clamped to the fork crown. Fitted over the lower end of the main tube is the bottom tube made of high strength aluminium alloy with an integral lug which carries the wheel spindle. Fitted on the lower end of the main tube is a steel bush which is a close fit in the bore of the bottom tube. The upper end of the bottom tube carries a bronze bush which is a close fit over the outside diameter of the main tube. The bush is secured to the bottom tube by means of a threaded housing which contains an oil seal. A stud known as the "spring stud" is fitted in the lower end of the bottom tube and a valve port is secured to the lower end of the main tube. As the fork operates oil is forced between the spring stud and the bore of the valve port forming a hydraulic damping system. A compression spring is fitted inside the main tube between the upper end of the spring stud and the upper end of the main tube. The lower end of the main tube and upper end of the bottom tube are protected by a cover secured to the fork crown.

2. Operation of the Fork

The fork provides a range of movement of 6 in. from the fully extended to the fully compressed position. The movement is controlled by the compression spring and by the hydraulic damping system. The hydraulic damping is light on the bump stroke and heavier on the rebound stroke, thus damping out any tendency to pitching or oscillation without interfering unduly with the free movement of the fork when the wheel encounters an obstacle.

The fork is filled with a light oil (S.A.E. 20) to a point above the lower end of the spring so that the damper chamber "B" is always kept full of oil. Upward movement of the wheel spindle forces oil from the lower chamber "A" through the annular space between the spring stud (38067) and the bore of the main tube valve port (38138) into the damper chamber "B."



SECTION OF FORK LEG

Fig. 1

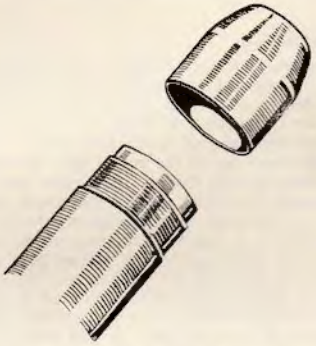
During this stroke the pressure on the underside of the valve plate (38073) causes this to lift so that oil can also pass from "A" to "B" through the eight holes in the valve body. Since, however, the diameter of chamber "B" is less than that of chamber "A" there is not room in "B" to receive all the oil which must be displaced from "A" as the fork operates. The surplus oil passes through the cross hole in the spring stud and up the centre hole in the stud, spilling out through the nut (38076) which secures the upper end of the spring stud to the bronze guide at the lower end of the fork spring.

On the rebound stroke the oil in the damper chamber "B" is forced through the annular space between the spring stud and the bore of the main tube valve port. During this stroke pressure in chamber "B" closes the two disc valves at the upper and lower ends of the chamber so that the only path through which the oil can escape is the annular space between the spring stud and the port. Damping on the rebound stroke is therefore heavier than on the bump stroke. At the extreme end of either bump or rebound stroke a small taper portion on the spring stud enters the bore of the valve port, thus restricting the annular space and increasing the amount of damping. At the extreme end of the bump stroke the larger diameter taper on the oil control collar (38075) enters the main counterbore of the valve port thus forming a hydraulic cushion to prevent metal to metal contact.

MAIN TUBE SPANNER
Fig. 2

3. Dismantling the Fork to Replace Spring, Oil Seal or Bearing Bushes

Place the machine on the centre stand, disconnect the front brake control and remove the front wheel and mudguard complete with stays. Knock the rearmost cap stud upwards into the fork with a soft mallet, which will allow oil to run out of the fork. Pull the fork bottom tube down as far as possible, thus exposing the oil seal housing (38157). Unscrew this housing either by means of a spanner on the flats with which it is provided or by using the gland nut hand grips (E.4912).



MAIN TUBE SEAL GUIDE
Fig. 3

The bottom tube can now be withdrawn completely from the main tube, leaving the bottom tube bush, oil seal housing and oil seal in position on the main tube.

Now unscrew the main tube valve port using "C" spanner (E.5418). The spring stud and spring can now be withdrawn from the lower end of the main tube.

The steel main tube bush (38156) can now be tapped off the lower end of the tube, if necessary using the bottom tube bush for this purpose. Before doing this, however, it is advisable to mark the position of the bush with a pencil line so as to ensure reassembling it in the same position on the main tube. The reason for this is that these bushes are finish ground to size after fitting on to the tubes so as to ensure concentricity. After removal of the main tube bush the bottom tube bush, oil seal housing and oil seal can be removed.

In case of difficulty in removing the main tube bush it is possible to withdraw the oil seal housing after loosening the crown clip bolt 39038, removing the plug screw 38968, and unscrewing the main tube from the fork head by means of a hexagon bar ·5 in. across flats (Unbrako wrench W.11) or the special tool shown in Fig. 2.

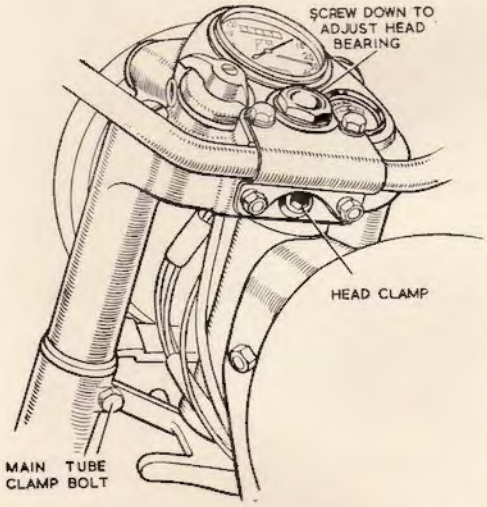
4. Spring

Solo and Sidecar springs are available. The free length of each is 20½ in. The spring should be replaced if it has closed by more than 1 in.

5. Reassembly of Parts

When refitting the oil seal, or fitting a new one, great care must be exercised not to damage the synthetic rubber lip which forms the actual seal. If the seal has been removed from the upper end of the main tube and is refitted from this end a special nose piece (Fig. 3) must be fitted over the end of the tube to prevent the thread from damaging the oil seal.

The spring stud is a tight fit in the hole at the lower end of the bottom tube. Once the stud has been entered in the hole push the bottom tube up sharply against the spring until two or three threads on the stud project beneath the end of the bottom tube. Now fit the nut and washer and pull the stud into position by tightening the nut. If necessary fit the nut first without the washer until sufficient thread is projecting to enable the washer to be fitted.

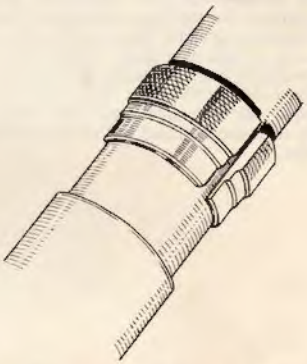


SHOWING THE POSITIONS OF THE CLAMP BOLTS SECURING THE STEERING STEM AND FORK TUBES

Fig. 4

6. Steering Head Races

The steering head bearing consists of two deep groove thrust races each containing nineteen ¼ in. diameter balls. The bearing is adjusted by tightening the steering stem locknut after loosening the ball head clip screw and both the fork crown clamp bolts. The head should be adjusted so



OUTER COVER CENTRALISING BUSHES

Fig. 5

that, when the front wheel is lifted clear of the ground, a light tap on the handlebars will cause the steering to swing to full lock in either direction, while at the same time there should be only the slightest trace of play in the bearings. When testing for freedom of movement the steering damper, if fitted, should be disconnected by unscrewing the anchor plate pin. Do not forget to tighten the ball head clip screw and fork crown clamp bolts. Before tightening the latter make sure that the cover tubes are located centrally round the main tubes so that the bottom tube does not rub inside the cover tube. A pair of split bushes (Fig. 5) is useful to ensure centralisation of the cover tubes.

7. Removal of Complete Fork

The fork complete with front wheel and mudguard can be removed from the machine if necessary by adopting the following procedure.

The leads to the lighting switch and ammeter should be disconnected from the battery, regulator, tail lamp, etc., at their lower ends or by means of the plug and socket connectors when these are

provided. The switch and ammeter are push fits into the rubber bushes in the fork head.

Disconnect the speedometer drive from the speedometer head. Remove the two plug screws (38968) and loosen the steering head clip bolt and the two fork crown clamp bolts.

Now unscrew the fork main tubes from the fork head and the steering stem locknut from the top of the steering stem, turning each tube and the nut a turn or two at a time. When the nut has been removed from the steering stem and the main tubes have been completely unscrewed from the fork head the complete fork and wheel with steering stem can be lifted out of the head lug of the frame.

8. Lubrication

The lubrication of the fork bearings is effected by the oil which forms the hydraulic damping medium. All that is necessary is to keep sufficient oil in the fork to ensure that the top end of the bottom spring stud is never uncovered even in the full rebound position. The level of oil in the fork can be gauged by removing the top plug screw and inserting a long rod about $\frac{3}{8}$ in. diameter. If slightly tilted this will ledge against the nut at the upper end of the bottom spring stud and indicate the level of oil above the stud. If the fork is empty to start with the quantity required is approximately $7\frac{1}{2}$ fluid ounces in each leg. Recommended grades of oil are Castrolite, Mobiloil Arctic, Essolube 20, B.P. Energol S.A.E. 20 and Shell X-100 20/20W.

SECTION K5

Front Wheel

With Single 7 in. Brake

1. Removal from Fork

To remove the front wheel from the fork place the machine on the centre stand with sufficient packing (about 2 in.) beneath each side of the stand to lift the wheel clear off the ground when tilted back on to the rear wheel. Slacken the brake cable adjustment and disconnect the cable from the handlebar lever and from the operating cam lever on the hub. Unscrew the four nuts securing the fork leg caps and allow the wheel to drop forward out of the front fork. Make sure that the machine stands securely on the rear wheel and centre stand—if necessary place a weight on the saddle or a strut beneath the fork to ensure this.

2. Removal of Brake Cover Plate Assembly

Lock the brake "on" by pressure on the operating lever and unscrew the cover plate nut. The cover plate assembly can then be withdrawn from the brake drum.

3. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets, Part No. 37787BX (7 in. shoes), or ready fitted to service replacement brake shoes, Part No. 38043 (7 in. shoes). When riveting linings to shoes, secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo AM2, which are drilled to receive cheese headed rivets.

A number of early "Crusader 250" models were fitted with brake linings bonded to the shoes. These should be returned for servicing when necessary.

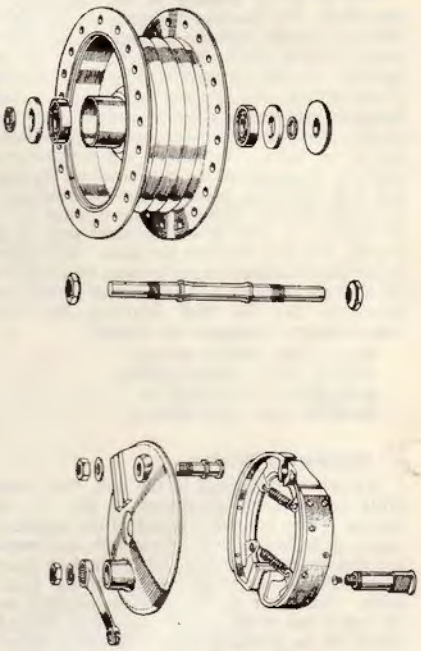
3. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets or ready fitted to service replacement brake shoes. When riveting linings to shoes, secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MS3, which are drilled to receive cheese-headed rivets.

4. Removal of Brake Operating Cam

To remove the operating cam unscrew the nut, 10314, which secures the operating lever to the splines on the cam. A sharp tap on the end of the cam spindle will now free the lever, after which the cam can be withdrawn from its housing.

To remove pivot pin, unscrew nut and tap out pin.



FRONT HUB AND BRAKE

Fig. 1

5. Removal of Hub Spindle and Bearings

To remove the hub spindle and bearings having first removed the brake cover plate, unscrew the retaining nut and remove the dust excluder from the non-brake side of the hub. Now remove the felt washers and distance washers and hit one end of the spindle with a copper hammer or mallet, thus driving it out of the hub, bringing one bearing with it and leaving the other in position in the hub. Drive the bearing off the spindle and insert the latter once more in the hub at the end from which it was removed. Now drive the spindle through the hub the other way, when it will bring out the remaining bearing.

6. Hub Bearings

These are deep-groove single-row journal ball bearings, $\frac{5}{8}$ in. i/d by $1\frac{2}{16}$ in. o/d by $\frac{7}{16}$ in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ $\frac{5}{8}$ in., Fischer LS7.

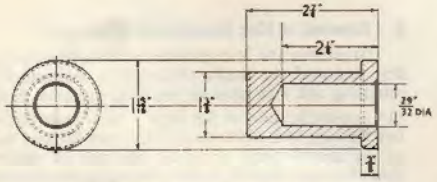
7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulder and the distance pieces, 30538, which in turn are held up by the nuts on the spindle. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in either end of the barrel. To prevent any possibility of sideways movement of the hub barrel on the bearings it is, therefore, necessary for the bearings to be a tight fit in the barrel, but this fit must not be so tight as to close down the outer race of the rearing, and thus overlead the balls. The following are the manufacturing tolerances which control the fit of the bearings. The figures for the bearings themselves are for SKF Bearings, but other manufacturers' tolerances are similar.

Bearing o/d, 1·5622/1·5617 in.
Housing bore, 1·5620/1·5616 in.
Bearing bore, ·6252/·6247 in.
Shaft diameter, ·6252/·6248 in.

8. Refitting Ball Bearings

To refit the bearings in the hub, two hollow drifts are required, as shown in Fig. 2. One bearing is first fitted to one end of the spindle by means of the hollow drift ; the spindle and bearing are then entered into one end of the hub barrel, which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper end of the spindle and driven home by means of the second hollow drift either under a press, or by means of a hammer, which will thus drive both bearings into position simultaneously.



DRIFT FOR REFITTING BEARINGS

Fig. 2

In order to make quite sure that there is clearance between the inner faces of the outer bearing races and the bottom of the recesses, fit the distance washers, cover plate, dust excluder and the nuts on the spindle. Tightening the nuts should not have any effect on the ease with which the spindle can be turned. If tightening the nuts makes the spindle hard to turn this may be taken as proof that the bearings are bottoming in the recesses in the hub barrel before they are solid against the shoulders on the spindle. In this case, the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.

9. Re-assembly of Brake Shoes and Operating Cam into Cover Plate

No difficulty should be experienced in carrying out these operations. Put a smear of grease on the pivot pin and on the operating face of the cam ; also on to the cylindrical bearing surface of the operating cam. Fit the operating lever on its splines in a position to suit the extent of wear on the linings and secure with the nut and washer. Note that the position of the operating lever may have to be corrected when adjusting the brake after refitting the wheel. The range of adjustment can be extended by moving this lever on to a different spline. Limit of wear is reached when the cam is turned through nearly 90° with the brake hard on, so that there is a danger that the operating springs cannot return the brake to the off position.

10. Final Assembly of Hub before Replacing Wheel

Before replacing the felt washers which form the grease seals, pack all bearings with grease. Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended, as these tend to be slightly corrosive if any damp finds its way into the hubs.

Make sure that the inside of the brake drum is quite free from oil or grease, damp, etc. Replace the felt washers, distance collars, dust excluder and brake cover plate and securely tighten the spindle nuts.

11. Wheel Rim

The wheel rim is WM2—17 in., plunged and pierced with forty holes for spoke nipples. The spoke holes are symmetrical, i.e., the rim can be assembled to the hub either way round. The rim diameter after building is 17·062 in., the tolerances on the circumference of the rim shoulders where

the tyre fits being 53·642/53·582 in. The standard steel measuring tape for checking rims is $\frac{5}{16}$ in. wide, ·011 in. thick, and its length is 53·676/53·616 in.

12. Spokes

The spokes are of the single-butted type, 8-10 gauge, with 90° countersunk heads, thread diameter ·144 in., 40 threads per inch, thread form British Standard Cycle. The inner spokes are $5\frac{5}{8}$ in. long with an angle of bend 100°, and the outer spokes $5\frac{3}{4}$ in. long with an angle of bend 80°.

13. Wheel Building and Truing

The spokes are laced one over two, and the wheel rim must be built central in relation to the faces of the nuts on the spindle. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus $\frac{1}{32}$ in.

14. Tyre

The standard tyre is Dunlop 3·25-17 in. Ribbed. When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small lever supplied in the tool-kit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation, make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark indicating a balance point, this should be fitted near the valve.

15. Tyre Pressure

The recommended pressure for the front tyre is 18 lb. per sq. in.

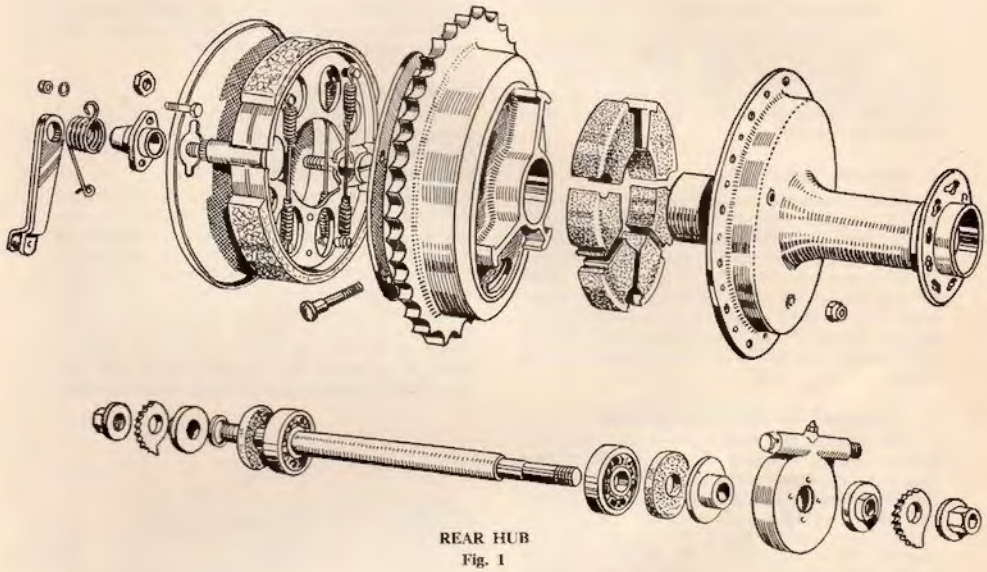
16. Lubrication

Grease the bearings by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity, it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

SECTION L7

Rear Wheel (Non-Detachable Type)



REAR HUB
Fig. 1

1. Description

These instructions cover the servicing of two different rear wheels, both of the non-detachable type incorporating a rubber cush drive and an internal expanding brake. Both types have a solid spindle and give a 3 in. chain line.

2. Removal and Replacement of Wheel

Place machine on the centre stand, if necessary putting packing pieces beneath the legs of the stand to lift the wheel clear of the ground. Remove the dual seat, if fitted, and the detachable portion of the rear mudguard. Disconnect the rear driving chain at the spring link and remove the chain from the rear wheel sprocket, leaving it in position on the gearbox countershaft sprocket. Unscrew the rear brake rod adjusting nut completely and depress the brake pedal so as to disengage the rod from the trunnion in the brake operating lever. Unscrew the brake cover plate anchor nut and remove this together with the washer behind it. Disconnect the speedometer driving cable, loosen the spindle nuts and mark the chain adjuster cams to ensure replacing in the same position. Slide the wheel out of the fork ends, tilting it so as to disengage the end of the brake shoe pivot pin from the slot in the fork end.

When replacing the wheel make sure that the dogs on the speedometer drive gearbox are engaged with the slots in the end of the hub barrel. Make sure also that the speedometer drive gearbox is correctly positioned so that there is no sudden bend in the driving cable. Make sure that the closed end of the spring link points in the direction of travel of the chain. Replace the chain adjuster cams in their original positions or, if necessary, turn each of them the same number

of notches to tension the chain and maintain correct wheel alignment. Do not forget to refit the brake rod and adjust the brake so that the wheel turns freely while the brake is off, while at the same time only a small travel of the brake pedal is necessary to put the brake on.

3. Removal of Brake Shoes for Replacement, Fitting New Linings, etc.

Remove the complete wheel as described above, then remove the left-hand spindle nut, chain adjuster and distance collar, thus permitting the complete brake cover plate with operating cam, pivot pin, shoes and return springs to be lifted off the hub spindle.

4. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets, Part No. 37786BX (6 in. shoes) or 37787BX (7 in. shoes), or ready fitted to service replacement brake shoes, Part No. 38042 (6 in. shoes) or 38043 (7 in. shoes). When riveting linings to shoes secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MR41 which are drilled to receive cheese headed rivets.

5. Removal of Hub Spindle and Bearings

To remove the hub spindle and bearings, having already removed the brake cover plate assembly and speedometer drive gearbox, lift out the felt washers and distance pieces then hit one end of the spindle with a copper hammer or mallet, thus driving it out of the hub, bringing one bearing with it and leaving the other in position in the hub. Drive the bearing off the spindle and insert the latter once more in the hub at the end from which it was removed. Now drive the spindle through the hub in the opposite direction, when it will bring out the remaining bearing.

6. Hub Bearings

These are deep-groove single-row journal ball bearings. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ $\frac{5}{8}$ in., Fischer LS7.

The bearings used are $\frac{5}{8}$ in. i/d by $1\frac{13}{16}$ in. o/d by $\frac{5}{8}$ in. wide. The Skefko Part No. is RMS5. Equivalent bearings are Hoffmann MS7, Ransome and Marles MJ $\frac{5}{8}$ in. and Fischer MS7.

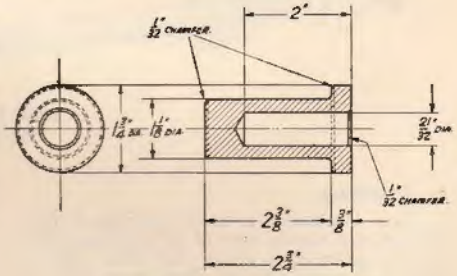
7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, which in turn are held up by the cover plate nuts. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in either end of the hub barrel. To prevent any possibility of sideways movement of the hub barrel on the bearings it is, therefore, necessary for the bearings to be a tight fit in the barrel but this fit must not be so tight as to close down the outer race of the bearing and thus overload the balls.

8. Refitting Ball Bearings

Note that the two ends of the spindle are not identical. The end with the shorter plain portion between the thread and the shoulder must be fitted to the brake drum side of the wheel.

To refit the bearings in the hub two hollow drifts are required, as shown in Fig. 2. One bearing is first fitted to one end of the spindle by means of the hollow drift ; the spindle and bearing are then entered into one end of the hub barrel which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper end of the spindle and driven home by means of the second hollow drift either under a press or by means of a hammer which will thus drive both bearings into position simultaneously.



DRIFT FOR REFITTING BEARINGS

Fig. 2

In order to make quite sure that there is clearance between the inner faces of the outer bearings and the bottom of the recesses fit the distance washers against the inner races of the bearings and either fit the assembly of brake cover plate, speedometer gearbox, etc., or make up this distance with tubular distance pieces. Fit and tighten the spindle nuts. Tightening the nuts should not have any effect on the ease with which the spindle can be turned. If tightening the nuts

makes the spindle hard to turn this may be taken as proof that the bearings are bottoming in the recesses in the hub barrel before they are solid against the shoulders on the spindle. In this case the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.

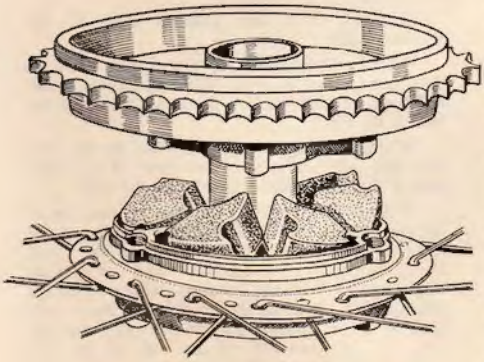
9. Removal of Brake Operating Cam and Brake Shoe Pivot Pin

The method of doing this has already been described in Paragraph 3 dealing with the 6 in. brake. The method is precisely the same for the 7 in. brake except that, owing to the different type of return springs used, it is, in this case, possible to remove the shoes from the pivot pin and operating cam before the latter are removed from the cover plate.

10. Cush Drive

The sprocket/brake drum is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar vanes are formed on the cush drive shell. Six rubber blocks are fitted between the vanes on the brake drum and those on the cush drive shell, thus permitting only a small amount of angular movement of the sprocket/brake drum relative to the hub barrel and transmitting both driving and braking torque and smoothing out harshness and irregularity in the former.

If the cush drive rubbers become worn so that the amount of free movement measured at the tyre exceeds ½ in. to 1 in., the rubbers should be replaced. To obtain access to them remove the complete wheel as described above, remove the brake cover plate complete with the brake shoe assembly, unscrew the three Simmonds nuts at the back of the cush drive shell—if necessary holding the studs by means of the flats on the heads inside the brake drum. Drive out the three studs into the brake drum after which the sprocket/brake drum can be separated from the cush drive shell and the six cush drive rubbers can be lifted out.



REASSEMBLY OF CUSH DRIVE

Fig. 3

When reassembling the cush drive the entry of the vanes between the rubbers will be facilitated if the latter are fitted into the driving shell first and then tilted. The rubbers should be liberally painted with soapsuds to facilitate entry of the vanes.

When reassembling the cush drive coat the inside of the bore of the sprocket/brake drum liberally with grease where it fits over the hub barrel and also put grease on the inner face of the lockring. The three Simmonds nuts should be tightened down solid as there is a shoulder on the stud which prevents tightening of the nuts from locking the operation of the cush drive.

11. Reassembly of Brake Shoes, Pivot Pin and Operating Cam into Cover Plate

No difficulty should be experienced in carrying out these operations. Make sure that the pivot pin is really tight in the cover plate and put a smear of grease in the grooves of the pivot pin and on the operating face of the cam ; also on the cylindrical bearing surface of the operating cam if this has been removed. Fit the operating lever and trunnion on its splines in a position to suit the extent of wear on the linings and secure with the nut. The range of adjustment can be extended by moving the lever on to a different spline.

12. Centering Cam Housing

Note that the bolt holes in the cam housing are slotted, thus enabling the brake shoe assembly to be centered in the drum. It is not intended that on rear brakes the cam housing should be left free to float but the shoes should be centered by leaving the screws just short of dead tight. The brake cover plate assembly with the shoes should then be fitted over the spindle into the brake drum and the brake applied as hard as possible by means of the operating lever. This will centre the shoes in the drum. The screws should then be tightened dead tight and secured with the locknuts. If the shoes are not correctly centered the brake will be either ineffective or too fierce, depending on whether the trailing or leading shoe

first makes contact with the drum. With the brake assembly correctly centered and the screws securing the cam housing correctly tightened wear on both linings should be approximately equal.

13. Final Reassembly of Hub before Replacing Wheel

Before replacing the felt washers which form the grease seals, pack both bearings with grease. Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds its way into the hubs.

Make sure that the inside of the brake drum is quite free from oil or grease, damp, etc. Replace the felt washers, distance collars, the brake cover plate assembly, speedometer drive gearbox, distance collars, chain adjuster cams, the loose section of the spindle and the spindle nut. The wheel is then ready for reassembly into the machine.

14. Wheel Rims

The rim fitted to both types of wheel is WM2—17 in. pierced with 40 holes for spoke nipples. The internal width is 1·580 in. and the diameter after building 17·062 in., the tolerance on the circumference of the rim shoulders where the tyre fits being 53·642/53·582 in. The standard steel measuring tape for checking rims is $\frac{1}{16}$ in. wide, ·011 in. thick and its length is 53·676/53·616 in.

15. Spokes

The spokes are of the single butted type 8—10 gauge with 90° countersunk heads, angle of bend 95°—100°, thread diameter ·144 in., 40 threads per inch, thread form British Standard Cycle. Spoke lengths are as follows :

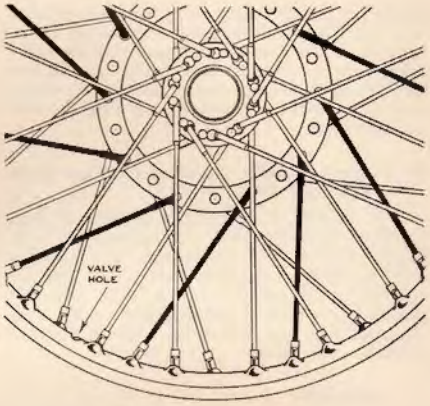
Cush drive side, $6\frac{3}{4}$ in.

Spoke flange side, $7\frac{3}{4}$ in.

16. Wheel Building and Truing

The spokes are laced one over three and the wheel must be built central in relation to the outer faces of the distance collars which fit between the fork ends. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus $\frac{1}{32}$ in.

The key to correct lacing is the inside spokes to the large flange on the cush drive shell which must slope in the direction shown in Fig. 4. With the Dunlop rim this spoke goes to the middle hole of one of the groups of three and the rim must be built into the wheel so that these groups of three holes are on the right of the centre line when the cush drive is on the left, i.e. the inside spokes to the large flange cross from the left to the right of the centre line.



DUNLOP RIM LACING

Fig. 4

17. Tyres

Standard tyres are Dunlop 3·50—17 in. studded tread.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small levers supplied in the tool-kit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark, indicating a balance point, this should be fitted near the valve.

18. Tyre Pressures

The load which the tyre will carry at different inflation pressures is shown below :

Tyre Section Inches	Inflation Pressures—lb. per sq. in.					
	16	18	20	24	28	32
	Load per tyre—lb.					
3·25	200	240	280	350	400	440

19. Lubrication

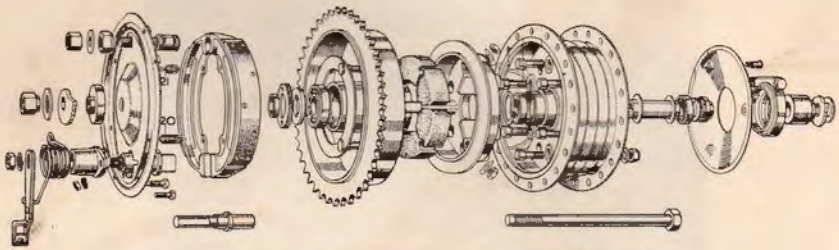
A greasing point is provided in the centre of the hub barrel. Unless the barrel is packed full with grease on assembly (which is apt to lead to trouble through grease finding its way past the felt seals on to the brake linings) this greasing point is of little value and the best way to grease the bearings is by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

SECTION L8

Rear Wheel

(Quickly Detachable Type with 7 in. diameter Brake and Full-Width Hub)



EXPLODED VIEW OF QUICKLY DETACHABLE REAR HUB
Fig. 1

1. Description

This wheel is of the "detachable" type, which enables the main portion of the wheel to be removed from the machine without disturbing the chain or brake. The wheel incorporates the well-known Enfield cush drive and also a 7-in. internal expanding brake.

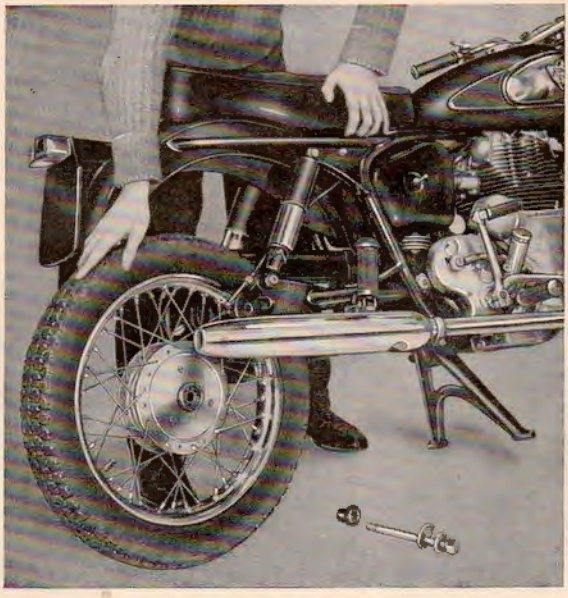
2. Removal and Replacement of Main Portion of Wheel for Tyre Repairs, etc.

Place the machine on the centre stand, if necessary putting packing pieces beneath the legs of the stand to lift the wheel clear of the ground. Unscrew the loose section of the spindle and withdraw this, together with the chain adjuster cam, preferably marking this to ensure that it is replaced in the same position. Now slide the distance collar out of the fork end and lift away the speedometer drive gearbox, which can be left attached to the driving cable. The spacing collar and the felt washer behind it may now be removed to prevent risk of them falling out when manipulating the tyre. If, however, these are too tight a fit in the hub to come out easily they may be left in place. The main body of the wheel can now be pulled across to the right-hand side of the machine, thus disengaging the six driving pins from the cush drive shell and enabling the wheel to be removed from the machine.

When replacing the main portion of the wheel, reverse the foregoing procedure. The cush drive shell can be prevented from rotating when turning the wheel to engage the six driving pins, if the machine is placed in gear or the rear brake is operated, taking care, when replacing the speedometer drive gearbox, that the driving dogs inside the gearbox engage with the slots in the end of the hub barrel. Before tightening the centre spindle make sure that the speedometer drive gearbox is correctly positioned so that there is no sharp bend in the driving cable.

3. Removal and Replacement of Complete Wheel for Access to Brake

Place the machine on the centre stand and remove the rear mudguard unit. Remove the five screws securing the two parts of the chaincase to the brake cover plate and remove the rear portion of case. Disconnect the rear driving chain at the spring link and loop the top end of



REMOVAL OF WHEEL (OFFSIDE VIEW)
Fig. 2

the chain over the tag provided at the top of the fixed portion of the chaincase. Pull on the other end of the chain and allow it to hang from the lower tunnel of the chaincase. This will ensure that the chain is not lost in the case. Unscrew the rear brake rod adjusting nut completely and depress the brake pedal so as to disengage the rod from the trunnion in the brake operating lever. Unscrew the brake cover plate anchor nut and remove this together with the washer behind it. Unscrew the loose section of the spindle two or three turns and the spindle nut by a similar amount. Mark the chain adjuster cams to ensure replacing in the same position.* Disconnect the speedometer driving cable and slide the wheel out of the fork ends, titlting it so as to disengage the end of the brake shoe pivot pin from the slot in the fork end.

* Note that the wheel is not necessarily correctly lined up when the same notch position is used on both adjuster cams. Once the position of the cams which gives correct alignment has been found this alignment will, however, be maintained if both cams are moved the same number of notches.

When replacing the wheel make sure that the dogs on the gear in the speedometer drive gearbox are engaged with the slots in the end of the hub barrel. Make sure also that the speedometer drive gearbox is correctly positioned so that there is no sudden bend in the driving cable. When replacing the connecting link in the driving chain, make sure that the closed end of the spring link points in the direction of travel of the chain. Replace the chain adjuster cams in their original positions or, if necessary, turn each of them the same number of notches to tension the chain and maintain correct wheel alignment. If the chain is adjusted it will be necessary to reposition the front part of the chaincase. This is easily done by slackening the two screws fastening it to the swinging arm chainstay before re-assembling the chaincase to the brake cover plate, then re-tightening the screws. Do not forget to refit the brake rod and adjust the brake so that the wheel turns freely when the brake is off, while at the same time only a small travel of the brake pedal is necessary to put the brake on.

4. Removal of Brake Shoes for Replacement, etc.

Remove the complete wheel as described above, then remove the spindle nut, chain adjuster and the distance collar, thus permitting the complete brake cover plate assembly, with operating cam, pivot pin, shoes and return springs, to be lifted off the hub spindle. The brake shoes can then be removed after detaching the return springs. Brake linings are supplied either in pairs ready drilled complete with rivets (Part No. 42469BX) or ready fitted to service replacement brake shoes (Part No. 41342SR). When riveting linings to shoes, secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MS3, which are drilled to receive cheese-headed rivets.

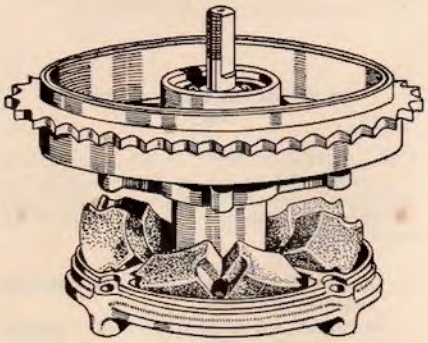
5. Removal of Brake Operating Cam

To remove the operating cam unscrew the nut which secures the operating lever to the splines on the cam. A sharp tap on the end of the cam spindle will now free the lever, after which the cam can be withdrawn from its housing.

Do not try to remove the brake shoe pivot pin and nut, as these are brazed to the cover plate.

6. Cush Drive

The sprocket/brake drum is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar vanes are formed on the cush drive shell. Six rubber blocks are fitted between the vanes on the brake drum and those on the cush drive shell, thus permitting only a small amount of angular movement of the sprocket/brake drum relative to the hub barrel and transmitting both driving and braking torques and smoothing out harshness and irregularity in the former.



REASSEMBLY OF CUSH DRIVE
Fig. 3

If the cush drive rubbers become worn so that the amount of free movement measured at the tyre exceeds $\frac{1}{2}$ in. to 1 in., the rubbers should be replaced. To obtain access to them remove the complete wheel as described above ; then unscrew the loose section of the spindle completely. The main portion of the wheel can then be lifted away from the assembly consisting of the fixed portion of the spindle, sprocket/brake drum complete with brake and the cush drive shell. Now remove the brake cover plate complete with brake shoes as described above, and unscrew the three nuts at the back of the cush drive shell after bending back the locking washers. The three studs are brazed to the lockring and should be driven out of the cush drive shell, each a little at a time to avoid distorting the lockring or bending the studs. The sprocket/brake drum can now be separated from the cush drive shell, and the six cush drive rubbers lifted out.

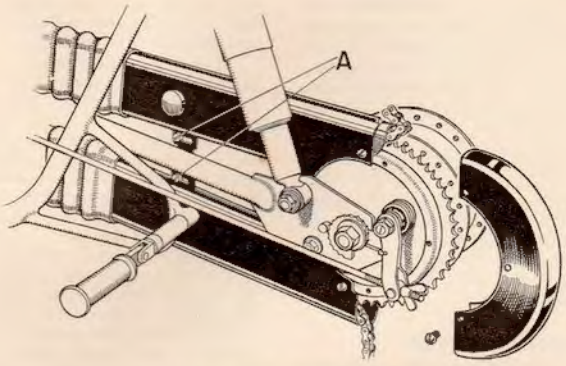
When reassembling the cush drive the entry of the vanes between the rubbers will be facilitated if the latter are fitted into the driving shell first and then tilted. The rubbers should be liberally smeared with soapsuds to facilitate entry of the vanes. Grease the inner face of the lockring before assembling and tighten the three nuts down solid as there is a shoulder on the stud which prevents tightening of the nuts from locking the operation of the cush drive. Do not forget to bend up the tabs of the three locking washers.

When reassembling the cush drive, coat the inside of the bore of the sprocket/brake drum liberally with grease where it fits over the hub barrel.

7. Removal of Ball Bearings

To remove the ball bearings take the complete wheel out of the machine and separate the main portion of the wheel from the sprocket/brake drum, cush drive shell assembly, as described above. To remove the bearing from the sprocket/brake drum, first remove the brake cover plate complete with brake shoe assembly ; then remove the distance collar and unscrew the bearing retaining ring with peg spanner. Now screw the loose section of the spindle into the fixed section and drive out the bearing by hitting the hexagon-headed end of the loose section of the spindle.

To remove the bearings from the loose half of the hub barrel, first lift away the distance collar, speedometer drive gearbox, the spacing collar and the felt washer. Remove the bearing retaining circlip from the driving sprocket end of the barrel.



REAR WHEEL ADJUSTMENT
Fig. 4

Between the two bearings is a spacer, slotted at one end to enable a drift to be used on the bearing at that end. Remove this bearing first, then enter the loose section of the spindle into the spacer and drive out the remaining bearing by means of a hammer and drift applied to the hexagon-headed end of the spindle.

8. Hub Bearings

These are deep-groove single-row journal ball bearings. The sprocket/brake drum bearing is a Skefko RLS7, $\frac{7}{8}$ in. i/d, by 2 in. o/d, by $\frac{9}{16}$ in. wide. Equivalent bearings of other makes are Hoffmann LS9, Ransome & Marles LJ $\frac{7}{8}$ in., and Fischer LS9. The two bearings in the hub barrel are Skefko RLS5, $\frac{5}{8}$ in. i/d, by $1\frac{9}{16}$ in. o/d, by $\frac{7}{16}$ in. wide. Equivalent bearings of other makes are Hoffmann LS7, Ransome & Marles LJ $\frac{5}{8}$ in., and Fischer LS7.

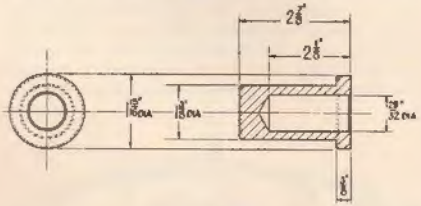
9. Removal of Hub Driving Pins

To remove the six driving pins from the aluminium full-width hub, first remove the hub cap after unscrewing the three screws attaching it to the hub. Unscrew the six Simmonds nuts and drive out the pins.

10. Refitting Ball Bearings

To refit the sprocket/brake drum bearing, use a hollow drift as shown in Fig. 5. The bearing is first fitted to the fixed section of the spindle ; the spindle and bearing are then entered into the sprocket/brake drum and driven home, preferably under a press or using light hammer blows.

The two bearings in the hub barrel are pressed in, using the drift part of E.4823. First assemble the bearing into the circlip grooved end of the barrel and fit the circlip. Replace the bearing spacer, the slot in the spacer can be at either end of the hubs, and assemble the second bearing, supporting the hub on the inner race of the other



DRIFT FOR RE-FITTING BEARING
Fig. 5

bearing. If the drift part of E.4823 is not available it is essential that the last bearing is assembled by applying pressure to both inner and outer races simultaneously to avoid pre-loading the two hub barrel bearings.

11. Reassembly of Brake Shoes and Operating Cam into Cover Plate

No difficulty should be experienced in carrying out these operations. Put a smear of grease in the grooves of the pivot pin and on the operating face of the cam ; also on to the cylindrical bearing

surface of the operating cam if this has been removed. Fit the operating lever and trunnion on its splines in a position to suit the extent of wear on the linings and secure with the nut. The range of adjustment can be extended by moving the lever on to a different spline.

12. Centering Cam Housing

Note that the bolt holes in the cam housing are slotted, thus enabling the brake shoe assembly to be centred in the drum. It is not intended that on rear brakes the cam housing should be left free to float but the shoes should be centred by leaving the screws just short of dead tight. The brake cover plate assembly with the shoes should then be fitted over the spindle into the brake drum and the brake applied as hard as possible by means of the operating lever. This will centre the shoes in the drum. The screws should then be tightened dead tight and secured with the locknuts. If the shoes are not correctly centred the brake will be either ineffective or too fierce, depending on whether the trailing or leading shoe first makes contact with the drum. With the brake assembly correctly centred and the screws securing the cam housing correctly tightened wear on both linings should be approximately equal.

13. Final Reassembly of Hub Before Replacing Wheel

Before replacing the felt washers which form the grease seals, pack all bearings with grease. Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds its way into the hubs.

Make sure that the inside of the brake drum is quite free from oil or grease, damp, etc. Replace the felt washers, distance collars, the brake cover plate assembly, speedometer drive gearbox, distance collars, chain adjuster cams, the loose section of the spindle and the spindle nut. The wheel is then ready for reassembly into the machine.

14. Wheel Rim

The wheel rim is type WM2-17 in. plunged and pierced with forty holes for spoke nipples. The spoke holes are symmetrical, i.e., the rim can be assembled to the hub either way round. The rim diameter after building is 17·062 in., the tolerances on the circumference of the rim shoulders where the tyre fits being 53·642/53·582 in. The standard steel measuring tape for checking rims is $\frac{5}{16}$ in. wide, ·011 in. thick, and its length is 53·676/53·616 in.

15. Spokes

The spokes are of the single butted type, 8-10 gauge, with 90° countersunk heads, thread diameter ·144 in., 40 threads per inch, thread form British Standard Cycle. The inner spokes are $5\frac{5}{8}$ in. long with an angle of bend 100°, and the outer spokes $5\frac{3}{4}$ in. long with an angle of bend 80°.

16. Wheel Building and Truing

The spokes are laced one over two and the wheel rim must be built central in relation to the outer faces of the distance collars. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus $\frac{1}{32}$ in.

17. Tyre

The standard tyre is Dunlop 3·25—17 in. studded tread.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small levers supplied in the tool-kit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark indicating a balance point, this should be fitted near the valve.

18. Tyre Pressures

The recommended pressures for the rear tyre are 22 lb. per sq. in. for a solo rider and 32 lb. per sq. in when a pillion passenger is carried.

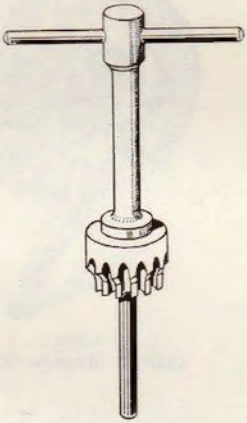
19. Lubrication

Grease the bearings by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

SECTION M6

Special Tools

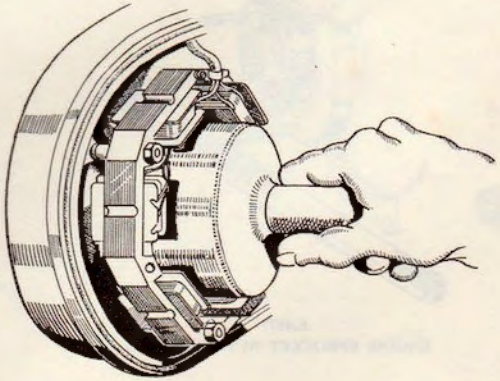


INLET VALVE SEAT ARBOR
T.2053 all models

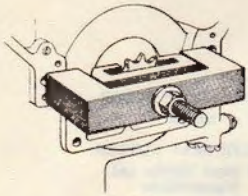
INLET VALVE SEAT CUTTER
T.2054 Super Meteor and Meteor Minor
T.2137 500 Twin
T.1892 500 Bullet
T.1891 350 Bullet

ASSEMBLY GAUGE IN USE TO CENTRALISE ROTOR

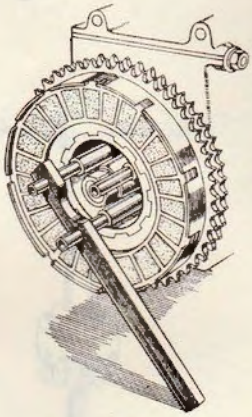
T.2055 Super Meteor and Meteor Minor, also 1956 350 Bullet and 500 Bullet
T.2138 1955-56 250 Clipper



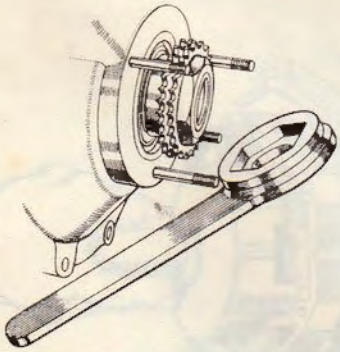
Special Tools for "Meteor 700"; "Super Meteor"; "500 Twin" and "Meteor Minor"



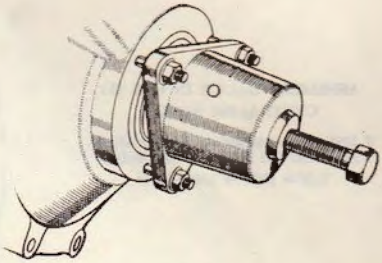
E.4869
TIMING SPROCKET EXTRACTOR



E.4871
CLUTCH HOLDING TOOL

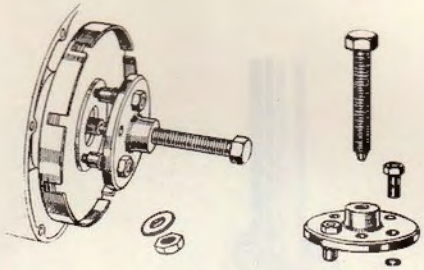


E.4877
ENGINE SPROCKET NUT SPANNER

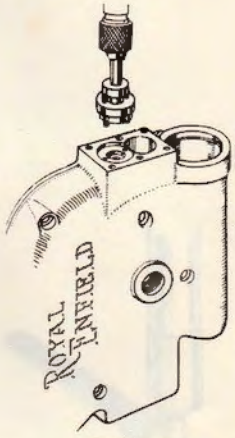


E.5121
CRANKSHAFT EXTRACTOR

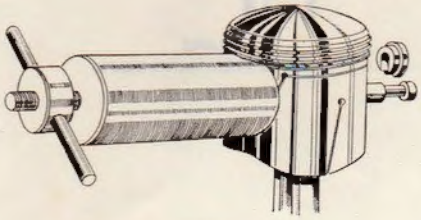
Special Tools for "Meteor 700"; "Super Meteor"; "500 Twin" and "Meteor Minor"



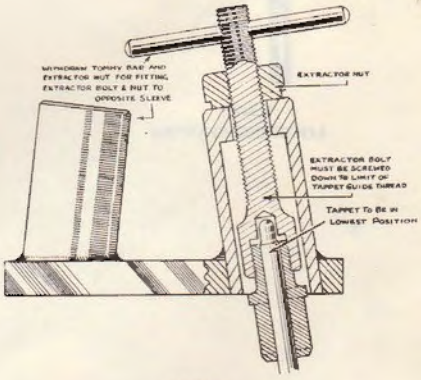
E.5414
CLUTCH HUB EXTRACTOR



E.5425
PUMP DISC LAPPING TOOL

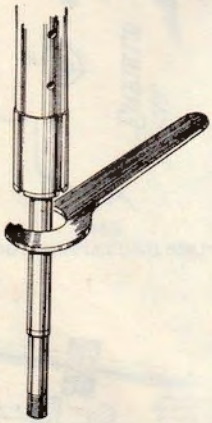


E.5477
GUDGEON PIN EXTRACTOR

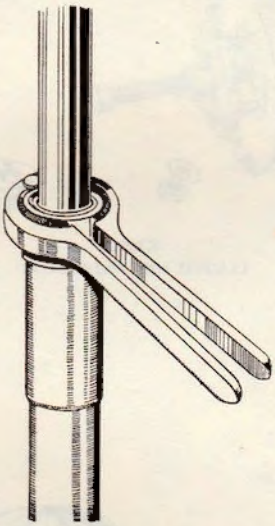


E.5790
TAPPET GUIDE EXTRACTOR

Special Tools for "Meteor 700"; "Super Meteor"; "500 Twin" and "Meteor Minor"

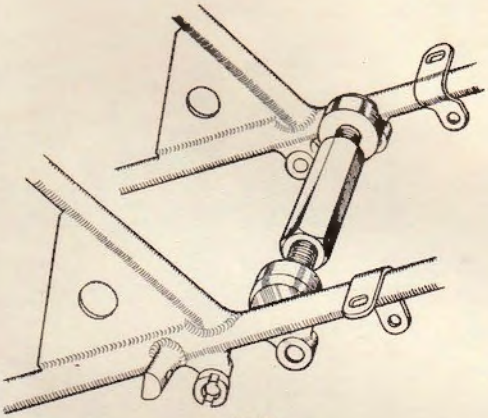


E.5418
LOCKRING SPANNER

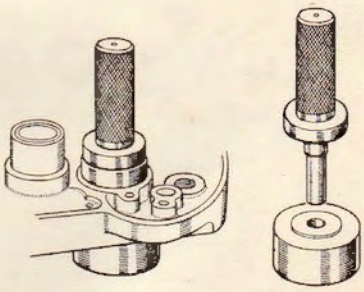


E.4912
OUTER TUBE HAND GRIPS

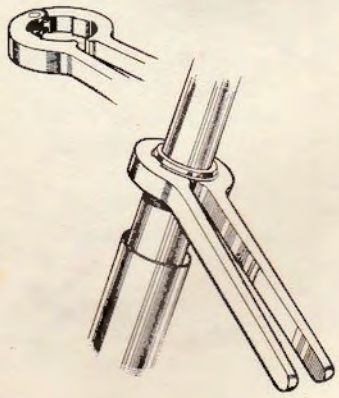
Special Tools for "Meteor 700"; "Super Meteor"; "500 Twin" and "Meteor Minor"



E.5431
FRAME EXPANDER



E.4823
GEARBOX COVER BALL BEARING



E.5417
GLAND NUT HAND GRIPS

SECTION P1

"Airflow" Fairing

1. Description of the Fairing

The "Airflow" fairing and front mudguard are fibre glass units and therefore very light, rigid and tough. The fairing, with the windscreen, provides full weather protection. It has two cubby holes and incorporates the headlamp, speedometer, ammeter and lighting switch.

On the rare occasions that it may be necessary to remove the mudguard and fairing from the machine, it will be found to present no difficulty if the following sequence is adopted:

2. Removal of the Windscreen

Remove the two screws which attach the number plate to the fairing. Removal of the number plate will expose a screw in the centre of the fairing which may now be taken out, together with the screws at each corner of the screen. The screen and metal back plate may now be lifted clear, taking care not to lose the five female screws with their plain steel and rubber washers.

3. Removal of the Headlamp

Take out the small screw from the underside of the headlamp rim. Raise the rim to clear its spigot plate from the slot in the lamp body shell and remove. Next take off the rubber ring from the light unit. By slackening the three light unit adjuster screws and rotating the light unit in an anti-clockwise direction, the unit may then be withdrawn sufficiently to disconnect the four leads.

Should it be necessary to remove the lamp body shell this may be done by unscrewing the four screws spaced round its flange. This also releases the rubber washer. Care should be taken not to lose the four screw locking plates inside the fairing.

4. Removal of the Headlamp Switch, Speedometer and Ammeter

Undo the switch knob screw and remove the knob. Unscrew the switch plate nut and remove the switch plate. The switch body may now be pulled out from beneath the fairing. Do not lose the plain washer situated beneath the switch knob.

Disconnect the speedometer drive, and, after removing two nuts, the spring washers and the bridge piece from the bottom of the speedometer, it may be removed.

To remove the ammeter it is only necessary to take off the rubber band from the body of the ammeter, after disconnecting the leads, and press down the small metal tabs which will be found turned outwards. The ammeter will then pull out from the top of the fairing.

5. Removal of the Front Wheel and Fork Legs

To remove the front wheel from the fork, place the machine on the centre stand with sufficient packing (about 2 in.) beneath each side of the stand to lift the wheel clear off the ground when tilted back on to the rear wheel. Slacken the brake cable adjustment and disconnect the cable from the handlebar lever and from the operating cam lever on the hub. Unscrew the four nuts securing the fork leg caps and allow the wheel to drop forward out of the front fork. Make sure that the machine stands securely on the rear wheel and centre stand—if necessary place a weight on the saddle or a strut beneath the fork to ensure this.

Unscrew the plug screws in the fork head, when the sliding fork legs, complete with springs and spring distance tubes, can be withdrawn from the lower ends of the main tubes.

6. Removal of the Front Mudguard

From the top of the fairing the two clamp bolts holding the mudguard to the fork crown can be reached. Unscrew the nuts and push out the bolts.

On Early Models it is necessary to remove the centre pin securing the guard to the bottom of the steering stem. The mudguard may now be withdrawn.

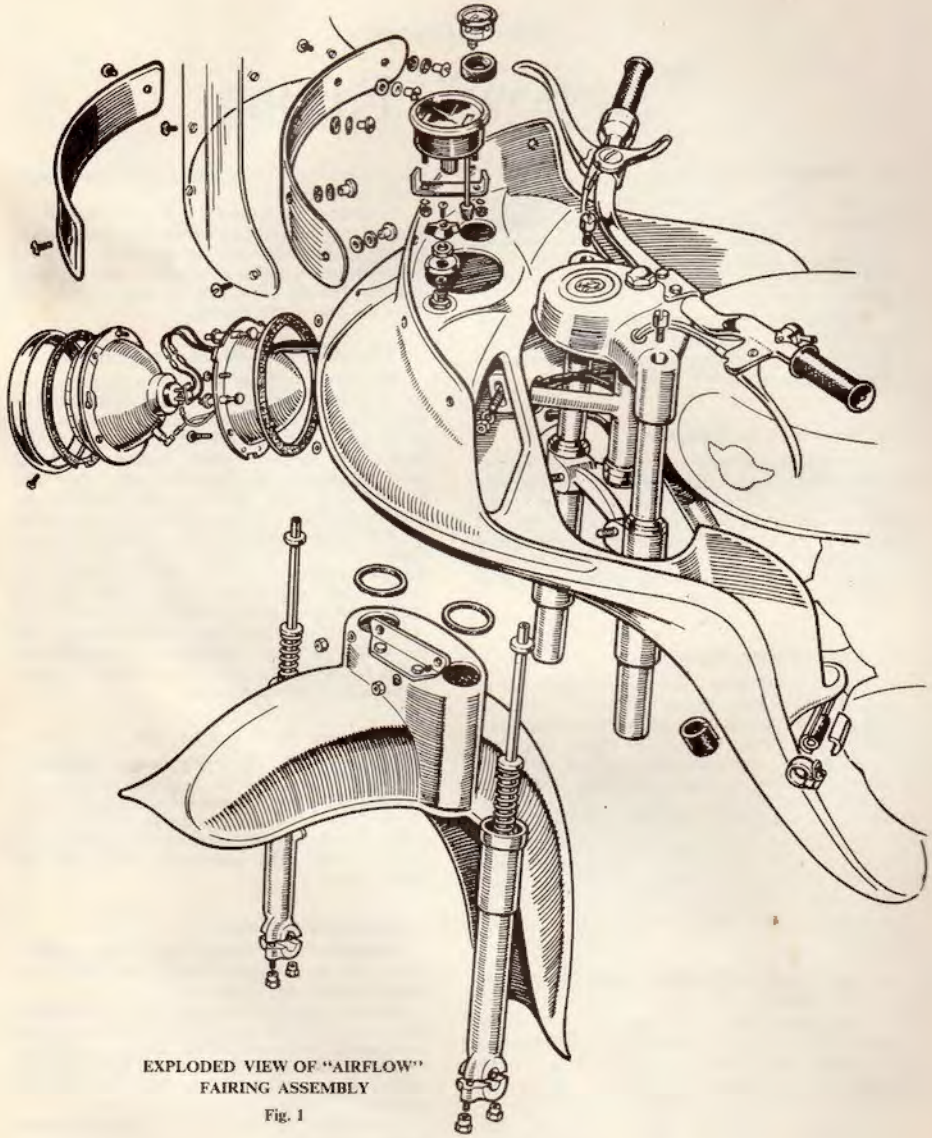
7. Removal of the Fairing

First take off the exhaust pipe. This is held to one of the front engine bearer bolts and to the pillion footrest stud at the rear.

Slacken the hose clips and remove the attachment caps from the ends of the attachment studs to which the lower part of the fairing is anchored.

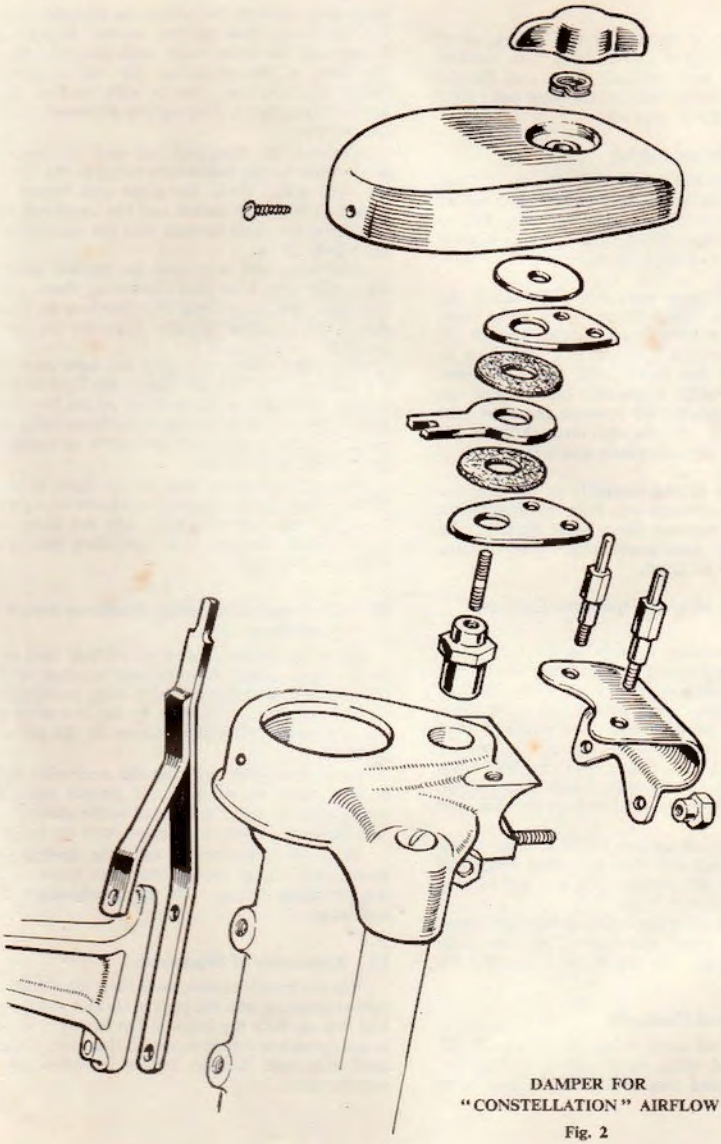
Unscrew the nuts and push out the stud which secures the upper part of the fairing to the tube extending forward from the steering head.

If required the two bottom attachment studs may be removed.



EXPLODED VIEW OF "AIRFLOW" FAIRING ASSEMBLY

Fig. 1



DAMPER FOR
"CONSTELLATION" AIRFLOW
Fig. 2

8. Repairs

In the event of damage to the fairing, small repair kits consisting of a quantity of resin, catalyst and glass fibre are available from our Service Department. Instructions for carrying out minor repairs are issued with this kit.

9. Reassembly of the Fairing

If these have been removed replace the two bottom fairing attachment studs, also fit the rubber sleeve to the down tube. Next raise the fairing over the fork cover tubes, locating the bottom attachment plates on each leg shield over the attachment studs.

Incline the fairing outwards and thread the light and switch leads through the strut tube aperture, and the speedometer cable through the smaller hole below it. The fairing can then be pushed towards the forks until the strut tube, complete with buffer assembly, has entered the aperture and is positioned between the strut tube attachment plates. Fit the stud through the buffer assembly and attachment plates and secure washers and nuts to either end.

Complete the fairing assembly to the machine by fixing the attachment cap over the attachment stud rubber. Compress these parts together and secure with the attachment clip. The exhaust system may now be fitted.

10. Reassembly of Mudguard, Fork Legs and Wheel

Fit the two sealing washers to the fork cover tubes—not forgetting the small sealing washer for the fork crown extension tube on Early Models. Raise the mudguard, and thread the cover tubes (and the fork crown extension when fitted) through their respective holes. Line up the mudguard bracket holes with the fork crown clip bolt holes and fit the bolts, washers and nuts finger tight. (On Early Models fit the fork crown extension stud and washer.)

Slide the fork legs up into the fork head. Centralise the fork leg top with the cover tube, and push up to the full extent. Fit and tighten the plug screws in the fork head.

The fork crown clip bolts may now be tightened.

Replace the wheel and connect up the brake cable at both ends. **Do not forget to readjust the brake.**

11. Reassembly of Headlamp

Thread the red earth wire, the blue and red, and the blue and white main bulb wires from the dipper switch, and one green and brown pilot lamp wire, through the hole in the lamp body shell. Fit the body shell rubber washer between the fairing and the lamp body shell rim, and line up the holes in the shell rim, the washer and the fairing aperture rim. Secure with the four screws and locking plates, keeping the threaded plate at the bottom.

Connect the blue and red and the blue and white wires to the main bulb wires in the back of the light unit. Push the green and brown lead into the pilot lamp socket and the single red earth wire from the main harness into the socket on the main bulb fitting.

The light unit may now be pushed over the three adjusters, after first slackening them. Turn the light unit in a clockwise direction to secure. Afterwards tighten all the adjusters as far as possible.

Place the rubber ring over the light unit, with the face marked "BACK" facing the light unit rim. Locate the spigot plate, situated on the top underside of the rim, with the slot in the lamp body shell. Press the rim downwards and screw in the pin at the bottom of the rim.

Finally, adjust the aim of the light beam by turning the adjuster screws in a clockwise direction from the rear as necessary. Do not turn them further than required—not more than two screws will need adjusting.

12. Reassembly of Ammeter, Headlamp Switch and Speedometer

Insert the ammeter into the off-side hole in the fairing, turn up under the fairing the small tabs on the ammeter, and fit the rubber ring, pushing it up as far as possible. Connect up the two wires with the tab washer type connections to the ammeter terminals.

Push the switch up from the underside of the fairing, place in position the switch plate and secure with the nut. Finally, put on the small washer and the switch knob, and secure with the screw.

Push the speedometer into the fairing from above, and secure the bracket with the nuts and washers from below. Fit the speedometer drive and lamp.

13. Reassembly of Windscreen

Put the female screws, with their plain steel and rubber washers, into the back plate and windscreen, and line up with the holes in the fairing. Be sure to use the shortest male screw for the centre countersunk hole, and the two longest for attaching the number plate.

Printed in England