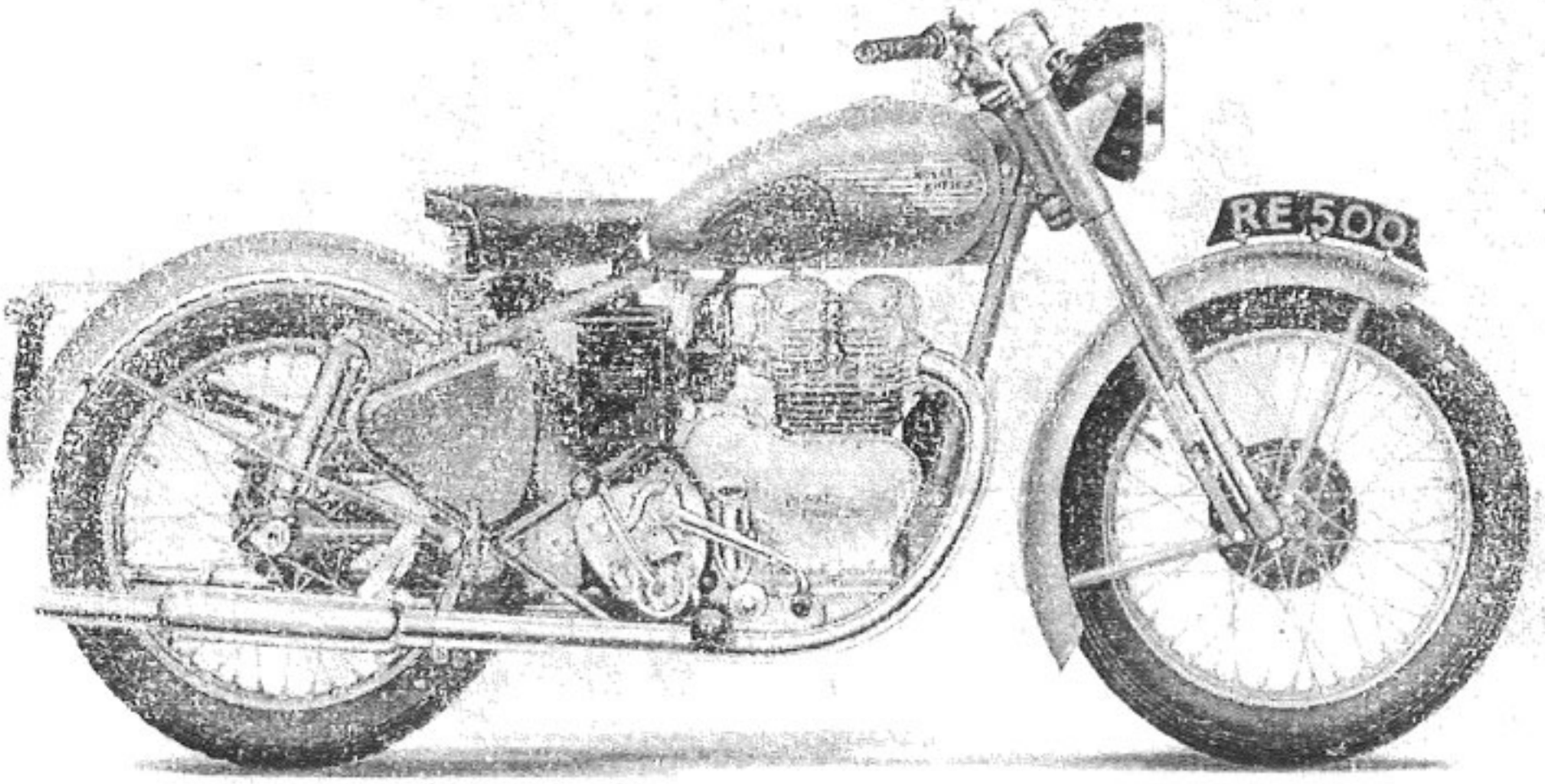
WORKSHOP MAINTENANCE MANUAL FOR THE

Royal Enfield

500 TWIN 1949—57
700 METEOR 1953—55

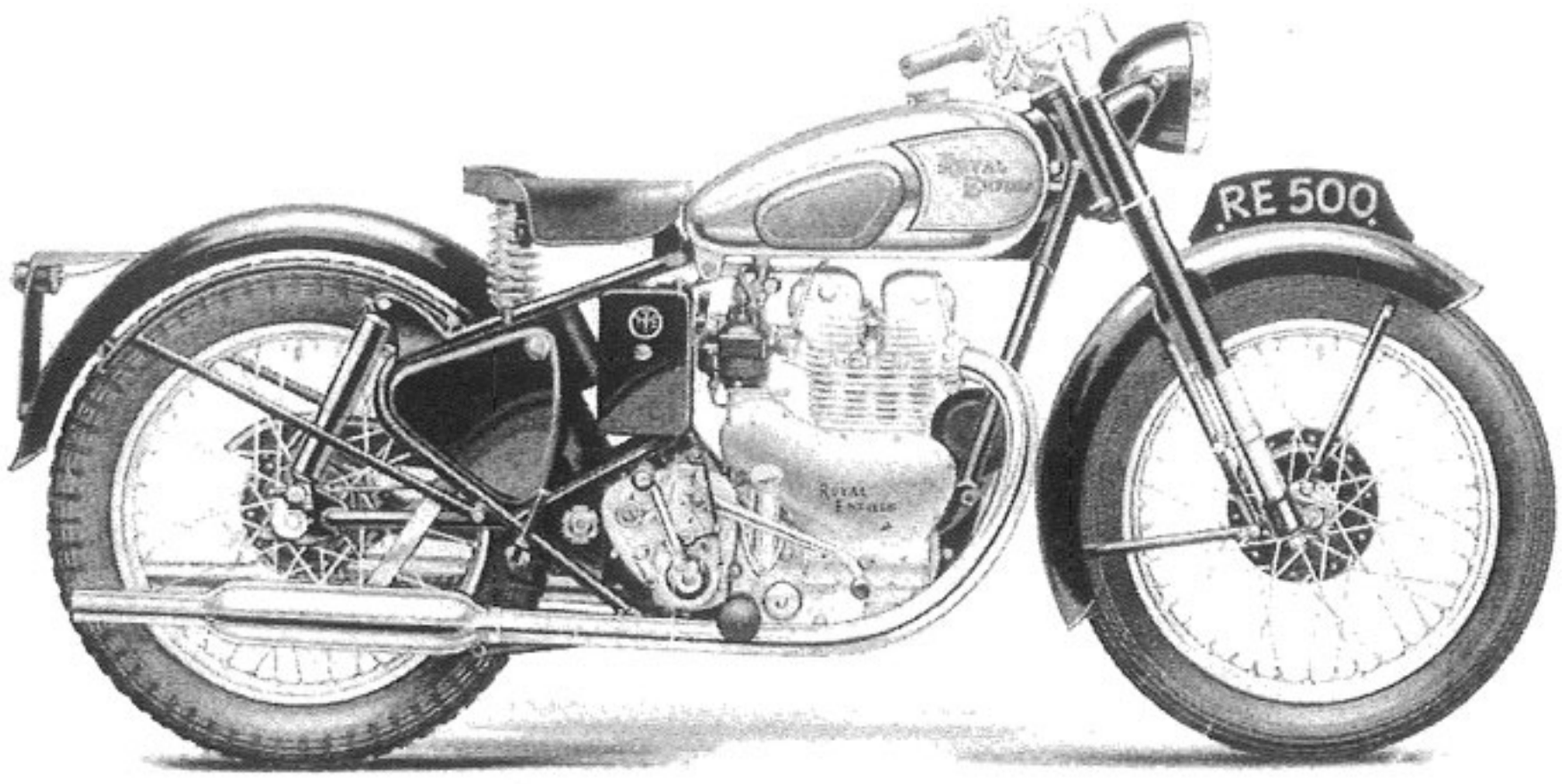


ROYAL ENFIELD WORKSHOP MANUAL

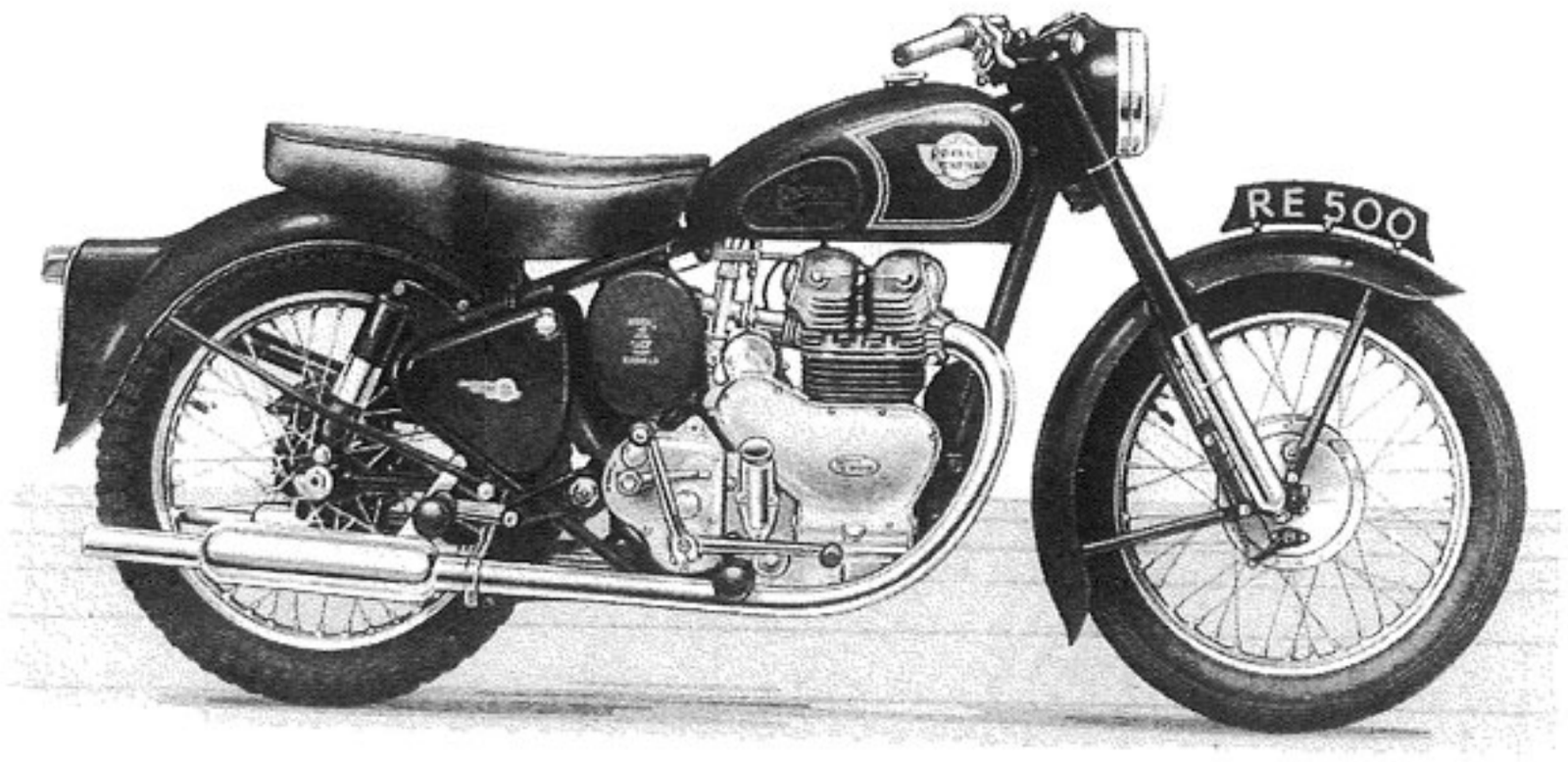
Contents

1949-57 500 Twin and 1953-1955 700 Meteor

ROYAL ENFIELD WORKSHOP MANUAL



500 TWIN 1951



500 TWIN 1956

SECTION Ala

Technical Data

"Meteor 700 " Engine

Cubic Capacity .... 692 c.c.
Stroke .... 90 m.m.
Bore .... Nominal 70 m.m.
Actual 69.874 m.m./2.751 in.
(Rebore to .020 in. when wear exceeds .0065 in. and again to .040 in. after further .0065 in. wear).

Compression Ratio ... ... 6.1/2 to 1

Piston Diameter-
Bottom of Skirt-Fore and Aft. 69.811 m.m.
Top Lands .. 69.32/69.27 m.m.
Skirt is tapered and oval-turned.

Piston Rings
Width-Plain Rings ..... .0625/.0635 in.
Scraper Ring ..... .1550/.1560 in.

Radial Thickness ..... 2.883/3.085 m.m.
Gap when in unworn Cylinder .011 / .015 in.
Clearance in grooves .001/ .003 in.
Renew Piston Rings when gap exceeds 1/16 in.
Various oversize Pistons and Rings available.
Piston Boss Internal Diameter ..... .7499/.7501 in.

Gudgeon Pin Diameter .7499/.7501 in.
ConRod Small End Internal Diameter .7507/.7505 in.
Big End Internal Diameter ..... 1.8535/1.8530 in.
Bearing Shell Internal Diameter 1.7515/1.7505in.
Crank Pin Diameter ..... 1.7500/1.7495 in.

Driving Side Main Ball Bearing
Type S.K.F.6209
Outside Diameter ..... 85 m.m.
Inside Diameter ..... 45 m.m.
Width .... 19 m.m.
Timing Side Main Roller Bearing-
Type .... S.K.F. N209
Outside Diameter ..... 85 m.m.
Inside Diameter ..... 45 m.m.
Width .... 19 m.m.

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 ..... .3743/.3740 in.
Tappet Guide Internal Diameter .3755/.3745 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:
Inlet .... Nil
Exhaust .... Nil

Valve Spring Free Length
Inner .... 2.1/32 in.
Outer ..... 2.3/32 in.
(Renew when reduced by 3/16 in.)
Valve Timing with .012 in. clearance--
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.

Camshaft Bearing External Diameter .9095/.9085 in.
Camshaft Bearing Internal Diameter .7505/.7495 in.
(Bored in position in crankcase)
Cam Lift .... .3125 in.
Valve Lift (approx.) .... .3125 in.

Timing Sprocket .... 12 Teeth
Camshaft Sprocket .... 24 Teeth
Magneto Sprocket .... 19 Teeth
Timing Chain-Type Single No. 110038 endless
Length .... 66 pitches
Width .... .225 in.
Pitch .... .375 in.
Roller .... .250 in.

Magneto Chain-Type Duplex No. 114500 endless
Length .... 44 pitches
Width .... 8.64 m.m.
Pitch .... 8 m.m.
Roller .... 5 m.m.

Magneto Speed ... . Half Engine Speed
Points ... . .012/.015 in.
Timing Advanced 3/8 in.-7/16 in. before T.D.C.

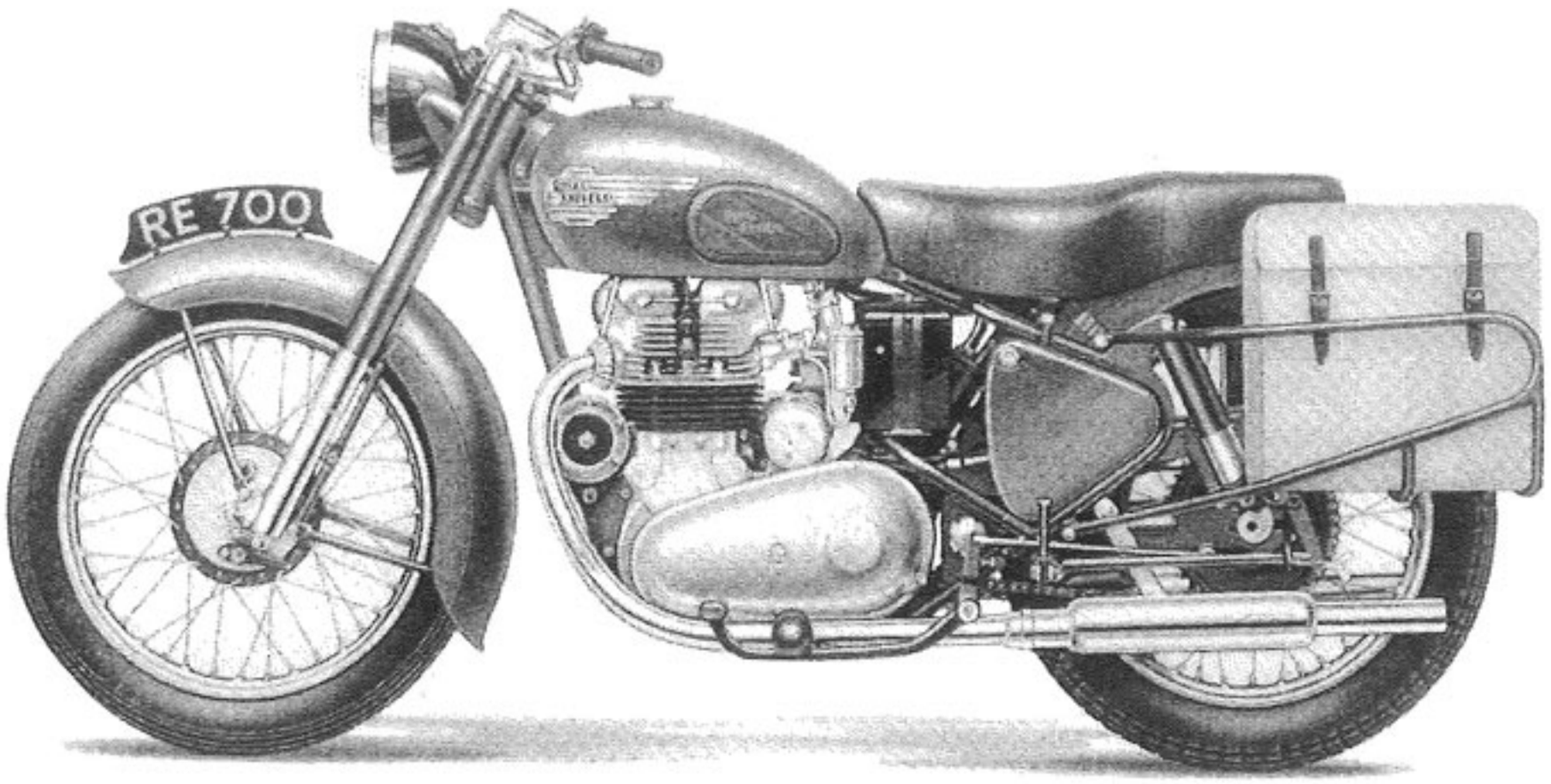
For Coil Ignition see Section C1.page 2.

Engine Sprocket .... 32 Teeth
Clutch Sprocket .... 56 Teeth
Final Drive Sprocket (Solo) .. .. 18 Teeth
Final Drive Sprocket (Sidecar) 16 Teeth
Primary Chain Type Duplex No. 114038 endless
Length .... 94 pitches
Width .... .628 in.
Pitch .... 375 in.
Roller .... .250 in.
Feed Oil Pump-Speed .... 1/6 Engine Speed
Piston Diameter .25 in. (nominal)
Stroke ... ... .5 in.

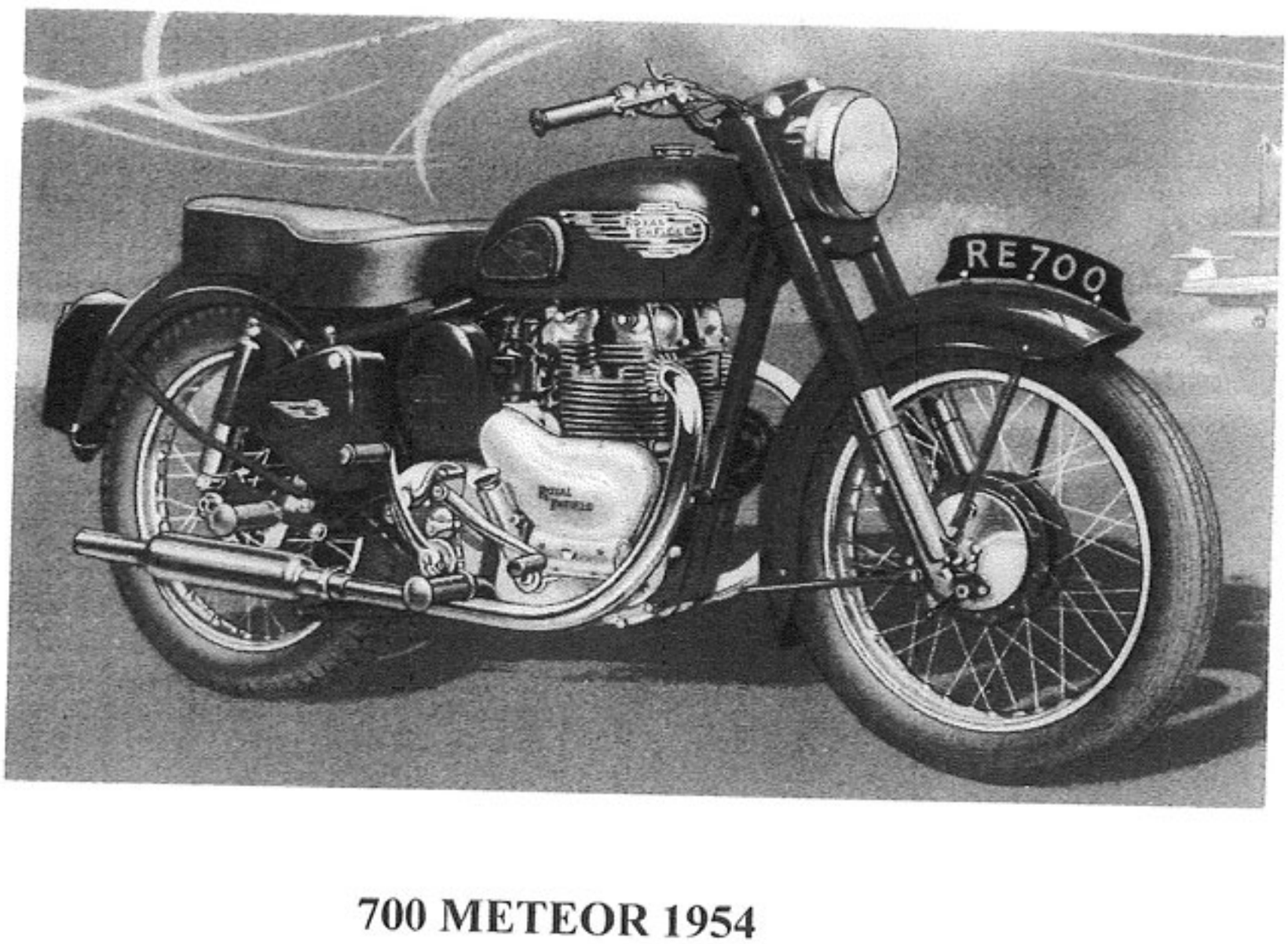
Return Oil Pump-Speed .. 1/6 Engine Speed.
Piston Diameter .375 in. (nominal)
Stroke ... ... .5 in.

Sparking Plug. Type ...Lodge CS14 K.L.G. F.50
Champion L10
Diameter 14 m.m.

ROYAL ENFIELD WORKSHOP MANUAL



700 METEOR 1953



700 METEOR 1954

SECTION Alb

Technical Data

"500 Twin " Engine

Cubic Capacity ....496 c.c.
Stroke .... 77 m.m.
Bore .... Nominal 64 m.m.
Actual 63.969 m.m.
(Rebore to .020 in. when wear exceeds .005 in. and again to .040 in. after further .005 in. wear).

Compression Ratio ... 7.1/2 to 1

Piston Diameter-
Bottom of Skirt-Fore and Aft. 63.830 m.m.
Top Lands .. 63.50/63.45 m.m.
Skirt is tapered and oval-turned.

Piston Rings
Width-Plain Rings ..... .0615/.0625 in.
Scraper Ring ..... .1552/.1562 in.

Radial Thickness ..... 2.460/2.612 m.m.
Gap when in unworn Cylinder .011 / .015 in.
Clearance in grooves .0005/ .0025 in.

Various oversize Pistons and Rings available.
Piston Boss Internal Diameter .7500/.7498 in.
Gudgeon Pin Diameter .7450/.7498 in.
ConRod Small End Internal Diameter .7507/.7505 in.
Big End Internal Diameter ..... 1.8535/1.8530 in.
Bearing Shell Internal Diameter ...1.7515/1.7505in.
Crank Pin Diameter ..... . 1.7500/1.7495 in.

Driving Side Main Ball Bearing
Type S.K.F.6209
Outside Diameter ..... 85 m.m.
Inside Diameter ..... 45 m.m.
Width ..... 19 m.m.
Timing Side Main Roller Bearing-
Type ..... S.K.F. N209
Outside Diameter .. .. 85 m.m.
Inside Diameter .... 45 m.m.
Width ..... 19 m.m.

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 ..... .3743/.3740 in.
Tappet Guide Internal Diameter .3755/.3745 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:
Inlet ..... Nil
Exhaust ..... Nil

Valve Spring Free Length
Inner ....2.1/32 in.
Outer .....2.3/32 in.
(Renew when reduced by 3/16 in.)

Valve Timing with .012 in. clearance--
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.

Camshaft Bearing External Diameter .9095/.9085 in.
Camshaft Bearing Internal Diameter .7505/.7495 in.
(Bored in position in crankcase)
Cam Lift .... .3123 in.
Valve Lift (approx.) .... .3125 in.

Timing Sprocket ....12 Teeth
Camshaft Sprocket ....24 Teeth
Magneto Sprocket ....19 Teeth
Timing Chain-Type Single No. 110038 endless
Length .... 66 pitches
Width .... .225 in.
Pitch .... .375 in.
Roller .... .250 in.

Magneto Chain-Type Duplex No. 114500 endless
Length .... 44 pitches
Width .... 8.64 m.m.
Pitch .... 8 m.m.
Roller .... 5 m.m.

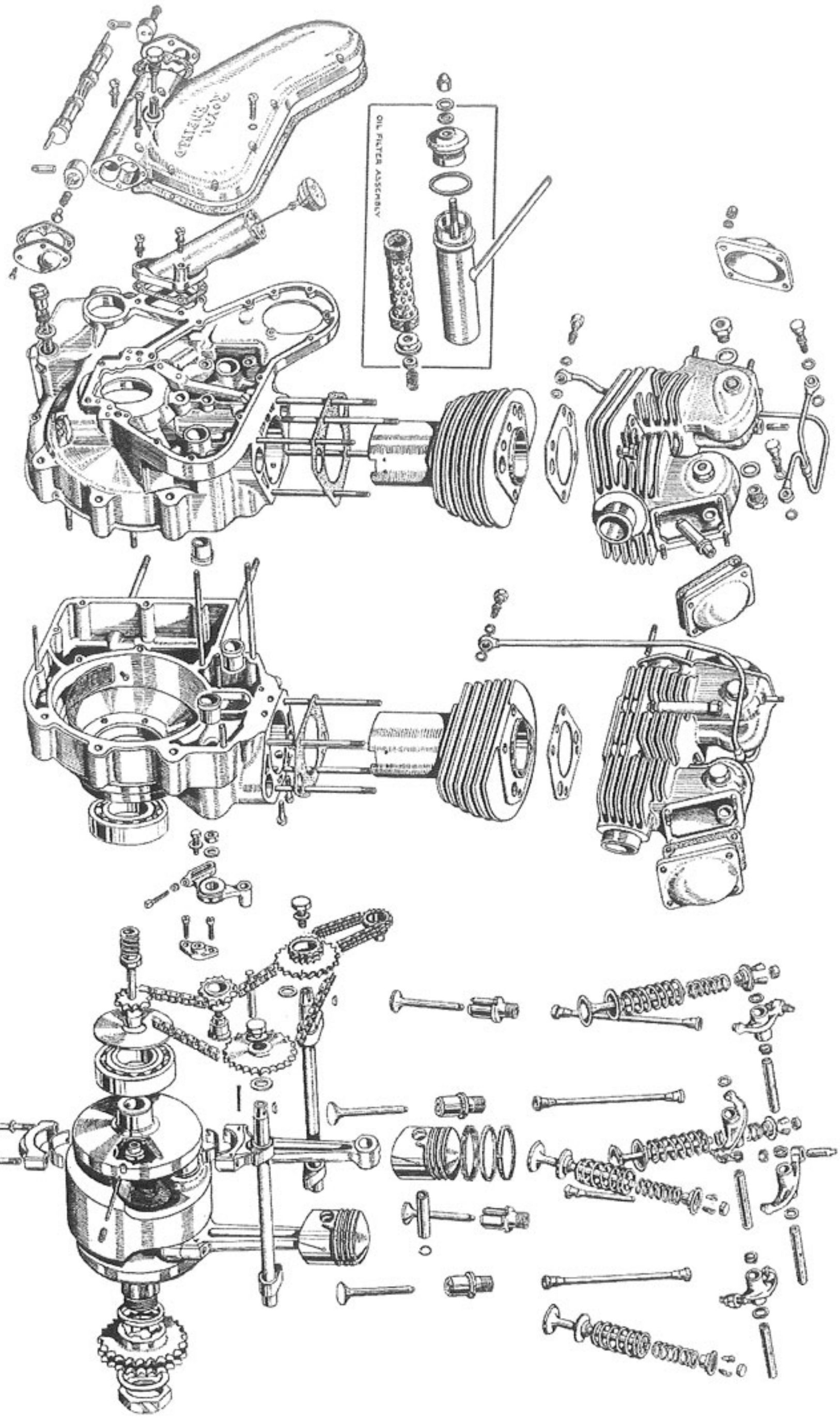
Magneto Speed ... . Half Engine Speed
Points ... . .012/.015 in.
Timing Advanced 5/16 in.-3/8 in. before T.D.C.

For Coil Ignition see Section C1.page 2.

Engine Sprocket .... 25 Teeth
Clutch Sprocket .... 56 Teeth
Final Drive Sprocket (Solo) .. .. 18 Teeth
Primary Chain Type Duplex No. 114038 endless
Length ..... 90 pitches
Width ..... .628 in.
Pitch ..... .375 in.
Roller ..... .250 in.
Feed Oil Pump-Speed .... 1/6 Engine Speed
Piston Diameter .25 in. (nominal)
Stroke ... ... .5 in.

Return Oil Pump-Speed 1/6 Engine Speed.
Piston Diameter .375 in. (nominal)
Stroke ... ... .5 in.

Sparking Plug. Type ...Lodge CS14 K.L.G. F.50
Champion L10
Diameter 14 m.m.



EXPLODED VIEW OF "METEOR 700" ENGINE

Fig. 1

SECTION B1

Engine Specification

"Meteor 700" and " 500 Twin"

1. Engine

The engine is an even-firing vertical twin cylinder, having separate cylinders and heads and fully enclosed pressure-fed overhead valve gear. It has dry sump lubrication with the oil tank integral with the crankcase and a massive one piece high-strength 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. Steel wire thread inserts which are easily renewable are provided for the sparking plugs to prevent damage to the threads in the heads. The large capacity induction ports are stream-lined and blended to the valve seatings.

On very early models, the cylinder heads were sand castings.

3. Cylinders

The cylinders are separate and of cast iron, with internal tunnels enclosing the push rods. The cylinder heads are located by spigots on the cylinder barrels.

"Meteor" Engine. The nominal bore is 70 m.m. and the stroke 90 m.m., giving a cubic capacity of 692 c.c.

"500 c.c. Twin" Engine. The nominal bore is 64 m.m. and the stroke 77 m.m., giving a cubic capacity of 496 c.c.

4. Pistons

The pistons are of low expansion aluminium alloy, heat-treated and form-turned oval and having split skirts. The compression ratio is 6.1/2 to 1 in the "Meteor" engine and 7.1/2 to 1 in the "500 Twin." 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. Some earlier models have bolts and castle nuts.

6. Crankcase

The combined crankcase and oil tank are 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 cromol or mehanite cast iron. The total weight is 26 lbs. and it is carefully balanced.

The main journals are ground and the big end journals are ground and hand-lapped.

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 cam profiles are produced with silencing ramps to ensure quiet running.

10. Valves

The inlet valves are machined from stampings of special Silicon-Chrome Valve Steel and the exhaust valves are of High Nickel-ChromiumTungsten Steel.

11. Valve Gear

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

On earlier models, steel push rods were used.

12. Timing Drive

The camshafts are located in the crankcase, running in bronze bushes. They are driven by a

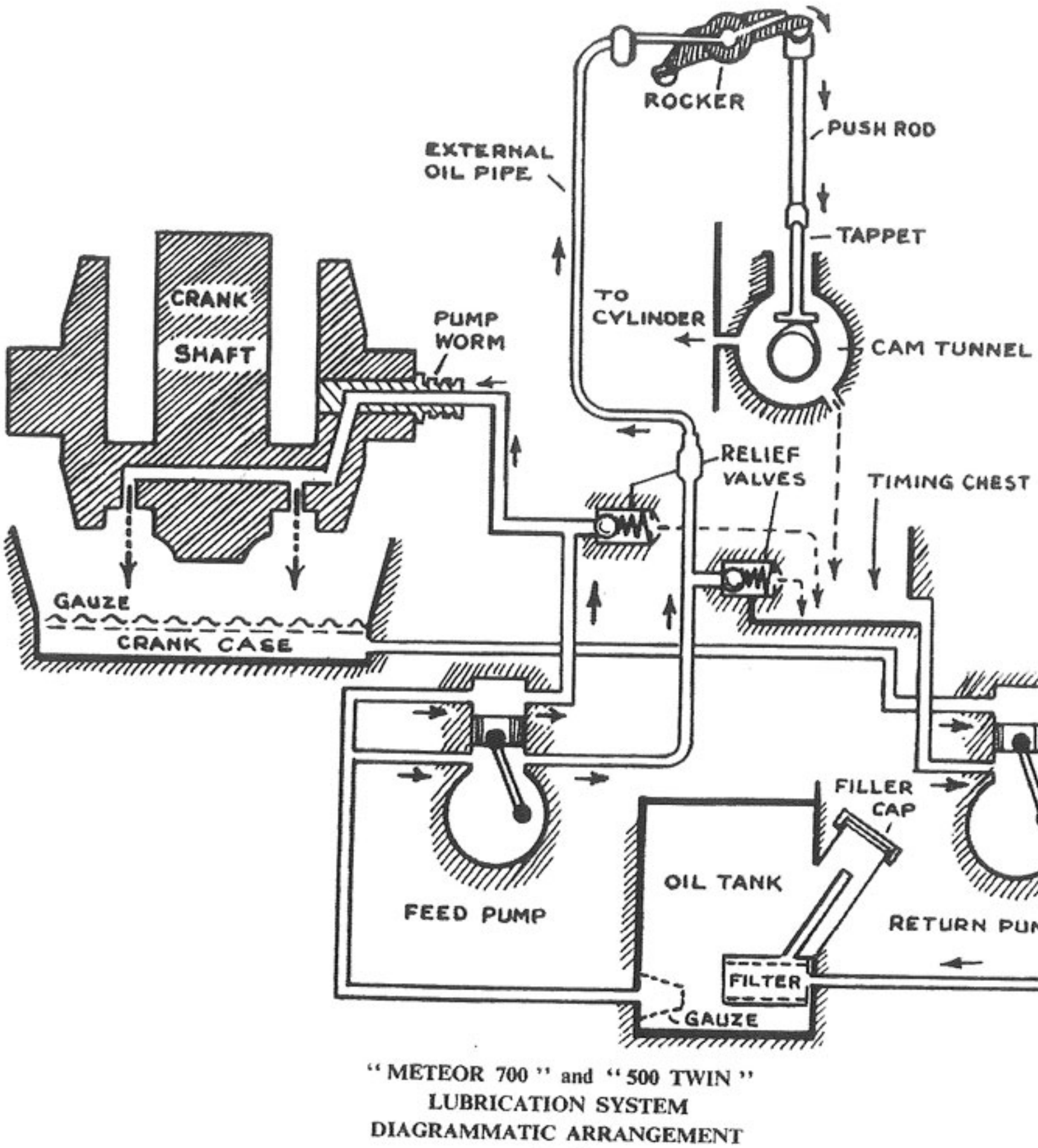
common, endless chain from the timing sprocket on the crankshaft and the tightness of the chain can be adjusted by means of the chain tensioner in the timing chest.

The magdyno (or dynamo and 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 magneto fixing bolts in their slotted holes.

13. Ignition and Lighting System

Lighting and ignition are supplied from a Lucas magdyno, which consists of a magneto running at 1/2 engine speed and a dynamo running at 1.1/3 engine speed.

The rate at which the dynamo charges the battery is controlled by an automatic regulator which limits the dynamo voltage to approximately 7 volts.



"METEOR 700" and "500 TWIN"
LUBRICATION SYSTEM
DIAGRAMMATIC ARRANGEMENT
Fig. 2

On earlier engines the ignition is provided by a coil energised from the battery and a distributor mounted above the dynamo. The dynamo is driven at engine speed by a chain from the rear camshaft.

14. Carburettor

"Meteor" Amal Type 276 FJ/IAT.
"500 Twin" Amal Type 276 DU/IAT.
Left hand throttle stop and pilot adjuster.

Standard bottom-feed float chamber, cranked at 7°.

Bore: "Meteor 700," 1.1/16 in.
"500 Twin," 15/16 in.

The correct settings are as follows:

	" Meteor "	" 500 Twin "
Main Jet	No. 170	No. 150
Needle Jet	No. 106	No. 109
Throttle Valve	6/4	6/4
Needle Clip	Middle Groove	No. 2 Groove

15. Air Filter

The air filter is a Vokes Micro-Vee felt and gauze dry filter, 5 in. diameter. It is housed in a metal box bolted to the frame.

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 1/6 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 through a gauze which prevents it being drawn up by the flywheel. On some models the gauze is replaced by a steel deflector plate.

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 cam tunnels through the cylinder walls for the purpose of lubricating the skirts of the pistons.

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.

Separate adjustable spring loaded relief valves control the pressure to the big ends and to the valve gear. The oil supply to the big ends is through internally drilled passages, and that to the valve gear through external pipes.** On later models the oil filter is in the oil feed to the big ends instead of the return circuit and is located in the bottom of the timing cover instead of in the oil tank.

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 cylinder 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 containing two small pen-steel discs covering two holes drilled in the crankcase. Accurate seating of the discs is ensured by a pensteel plate held between the breather body and the crankcase. On early models the breather is in the end of the crankshaft.

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.

The standard gear ratios are as follows:

" 500 Twin " (solo). 5, 6.5, 9, 13.9:1
" Meteor " (solo). 4.47, 5.8, 8.05, 12.4:1
"Meteor"(sidecar). 5.03, 6.53, 9.05, 13.95:1

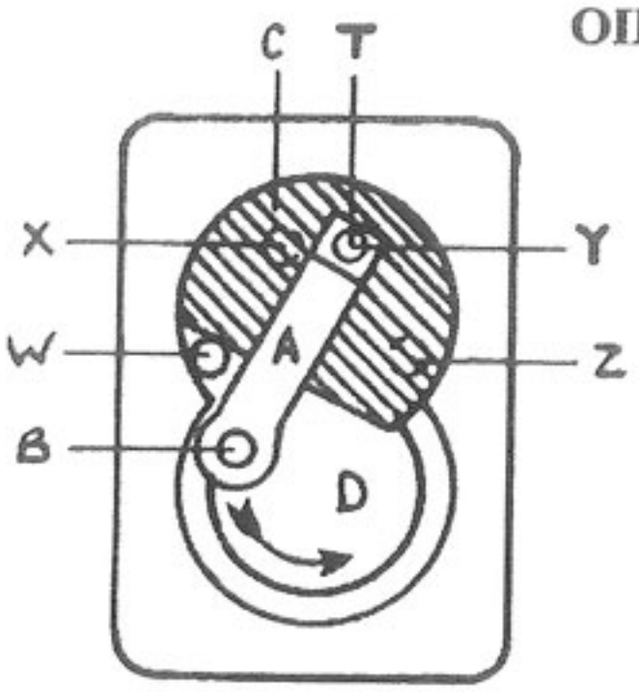
19. Clutch

"Meteor" Engine. The clutch has six pressure plates and five friction plates, including the sprocket which is lined on both sides with friction material. The other friction plates have cork or Klinger inserts which give smooth operation and freedom from slipping in the presence of oil. The clutch centre is fitted with shock absorbers consisting of rubber blocks.

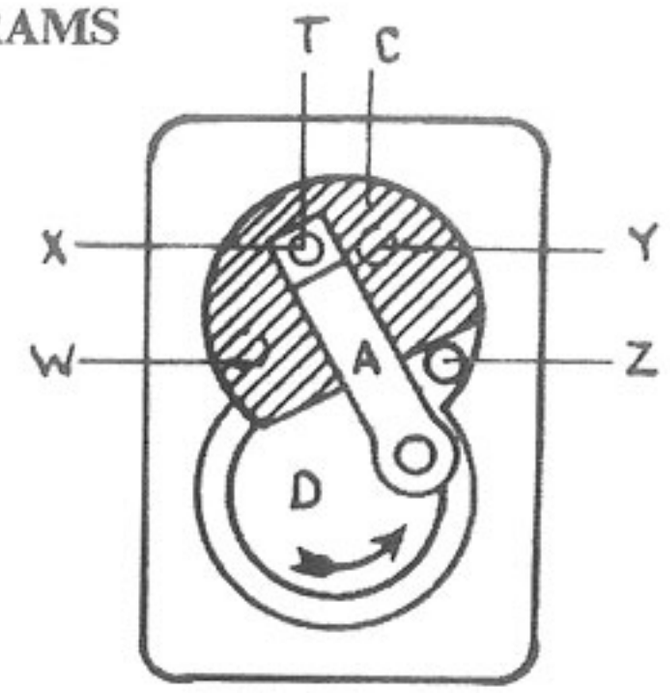
" 500 Twin" Engine. The clutch is similar to that on the " Meteor" engine except that there are five pressure plates and four friction plates and the clutch centre is solid.

***1/12 engine speed on early models. ** Early "500 Twins" had internal passages leading to the rocker gear.**

OIL PUMP DIAGRAMS



FEED PUMP
POSITION 1



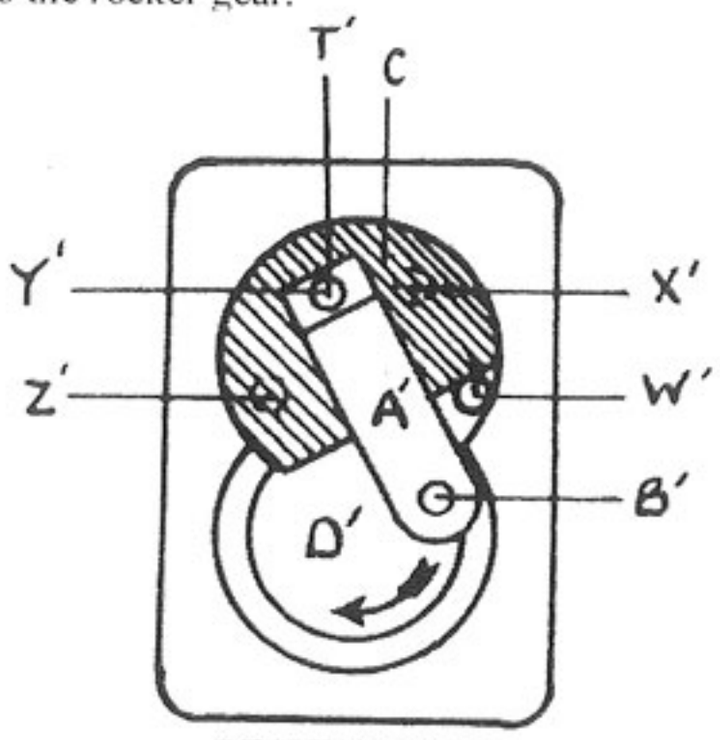
FEED PUMP
POSITION 2

Fig. 3A

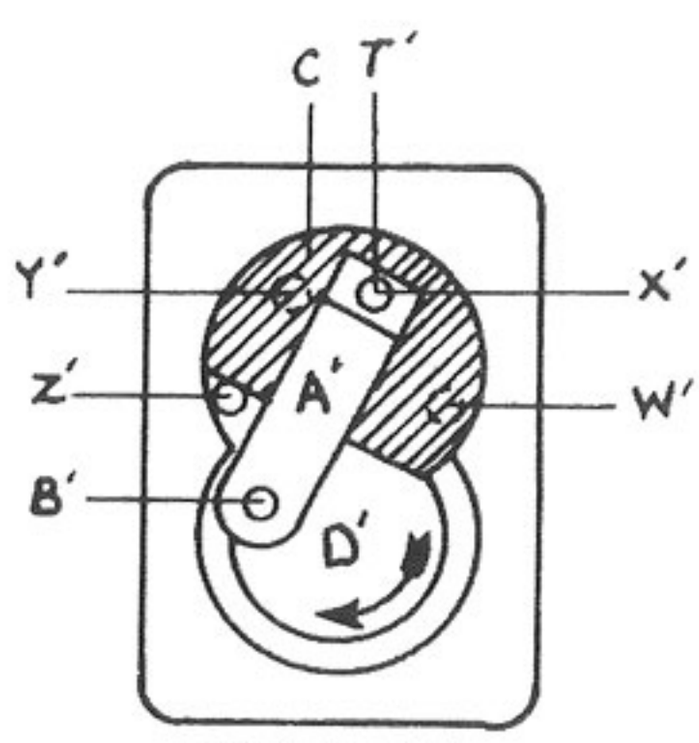
The ports in the housing are connected as follows
W - delivery to rocker gear. Y - suction from oil tank.
X - delivery to big ends. Z - suction from oil tank.

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. Y' - suction from crankcase. (On early models Y'
X' - delivery to oil tank. Z' - suction from timing chest. and Z' were reversed)

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 C1

Service Operations with Engine in Frame

" Meteor 700" and " 500 Twin"

1. Removal of 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 and 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 rubber seal is in the hole in the oil pump worm. Replace this seal if it is damaged or at each service to ensure oil pressure to the big end bearings.

When refitting the cover it is important that 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.

To verify that the oil pumps are working after replacing the timing cover, start the engine up and remove the oil filler cap so that the oil return pipe can be seen.

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 maladjusted.

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 (see Fig. 3). If it is necessary to remove the sprockets, see Subsections 23 and 24.

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

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

Exhaust Opens 75° before bottom dead centre.
Exhaust Closes 35° after top dead centre.
Inlet Opens 30° before top dead centre.
Inlet Closes 60° after bottom dead centre.

3. Tappet adjustment

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

The clearance between the end of the screw and the valve stem cap should be nil or as little as possible with the engine COLD.

To adjust the clearance, loosen the locknut beneath the rocker arm, turn the screw with a small spanner and re-tighten 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 is 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

Magdyno. The setting of the ignition depends upon the position of the sprocket relative to the magneto shaft.

To obtain access to the magneto sprocket it is necessary to remove the timing cover.

The sprocket is mounted on a smooth taper on the magdyno shaft and is held in position by a nut **(Right Hand Thread).** To remove the sprocket, undo the nut and use a suitable extractor.

Before setting the timing, adjust the contact breaker points to a clearance of .012/.015 in. when fully opened and put the ignition lever in the full advance position. See that the screw in the magneto ring is in the end of the slot and that it is not sticking.

To set the timing, turn the "Meteor" engine until the left hand piston is 3/8 – 7/16 in. before top dead centre on the compression stroke, i.e. with both valves closed.

Insert a piece of thin tissue paper between the points of the contact breaker and turn the magneto forwards until the paper can just be pulled out, making sure that the magneto rotor is in the position to cause a spark on the left hand cylinder sparking plug. Give the sprocket a sharp tap to secure it on the shaft and then lock it by tightening the nut.

The 500 c.c. engine has a shorter stroke and the timing should therefore be set at 5/16 - 3/8 in. before top dead centre.

Coil Ignition. On earlier models a dynamo and distributor were fitted, instead of the magdyno, and coil ignition was used. The distributor includes an automatic advance mechanism which is normally in the "retard" position when the engine is stationary.

The correct setting for the timing is for the contact breaker points to open when the pistons are 1/32 in. **after** top dead centre.

Before setting the timing, remove the rotor arm of the distributor and adjust the contact breaker points to a clearance of .014/.016 in.

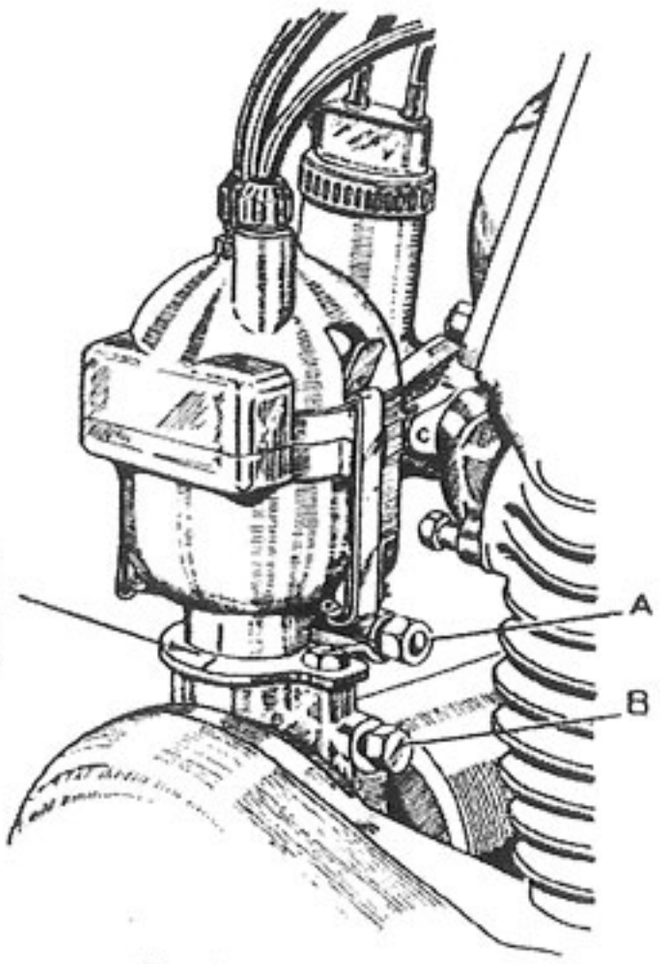
An approximate setting can be obtained by engaging the most suitable tooth on the dynamo sprocket with the chain when re-assembling the engine or by slackening the screw securing the distributor and replacing it in a different tooth of the skew gear drive. The flat side of the distributor body should be lined fore and aft to avoid the terminal screw fouling the air cleaner.

Make sure that the rotor arm of the distributor is pointing towards the contact connected to the plug lead of the cylinder which is on compression, i.e. with both valves closed.

The fine adjustment of the timing is made by turning the engine until the pistons are 1/32 in. **after** top dead centre and then (having slackened the securing screw A) rotating the distributor body until the contact breaker points are just opening. Then tighten the securing screw.

This point can be determined by inserting a thin piece of tissue paper between the contact breaker points and turning the distributor housing until the paper can just be drawn out.

An alternative method is to remove the cap from the plug lead and tuck the lead between the fins of the cylinder. Switch on the ignition and rotate the distributor until a spark is seen at the instant the points open. Move the distributor body clockwise to retard the timing and anticlockwise to advance it.



Mark top of clip and neck of distributor as shown before disturbing.

Fig. 1

5. Primary Chain Adjustment

Access to the primary chain adjuster is gained by removing the primary chain cover, which is held in position by a single nut. Before removing the nut, place a tray under the engine to catch the oil from the chain case.

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.

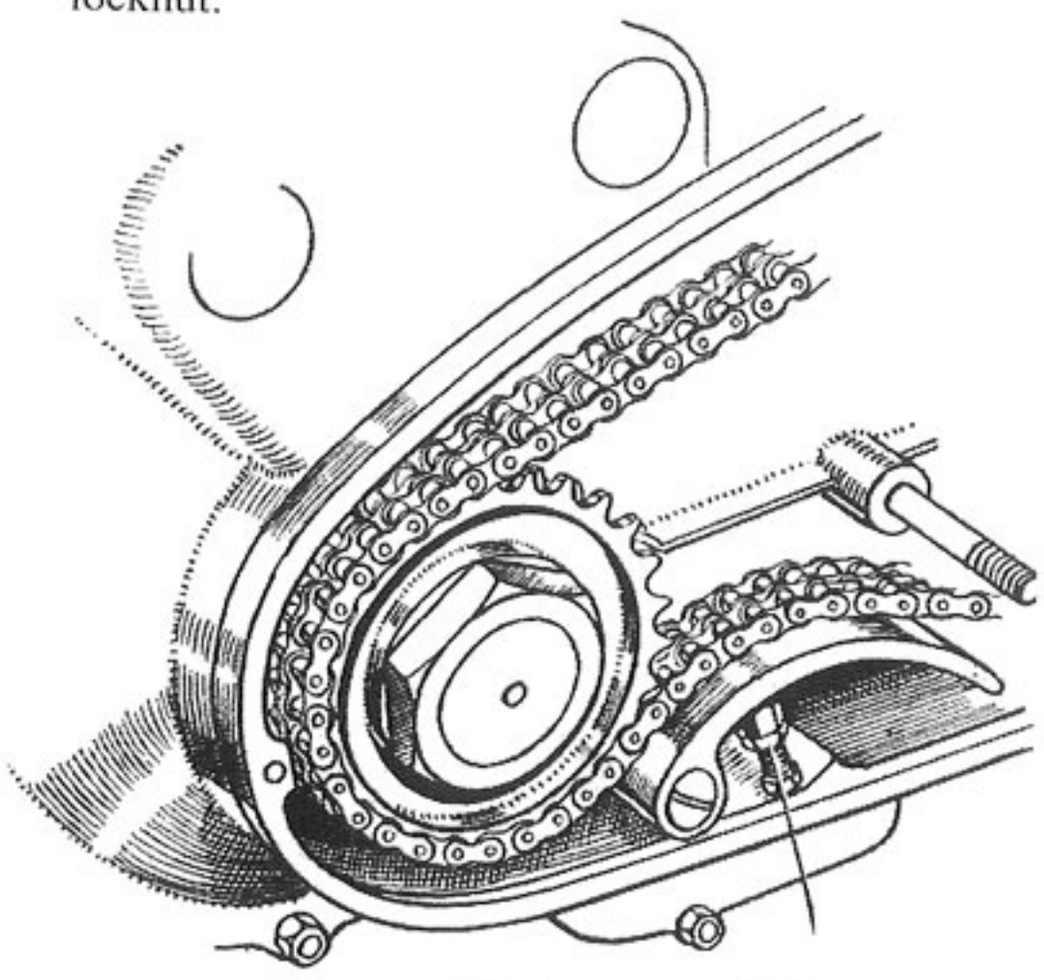


Fig. 2 ADJUSTER

To take up slack in the primary chain, unscrew the locknut and turn the adjuster beneath the curved slipper until correct chain tension is obtained ; re-tighten the locknut.

On the "Meteor" engine 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 chain case and bouncing is prevented by a hairpin spring. This is not necessary on the "500 Twin" because the chain line is different on account of the smaller sprocket.

After replacing the chain cover, remember to replenish the chain case with oil.

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 1/4 in. up and down movement at the tightest spot.

Re-tighten the locknut on the adjusting screw, replace the chain cover and replenish with oil.

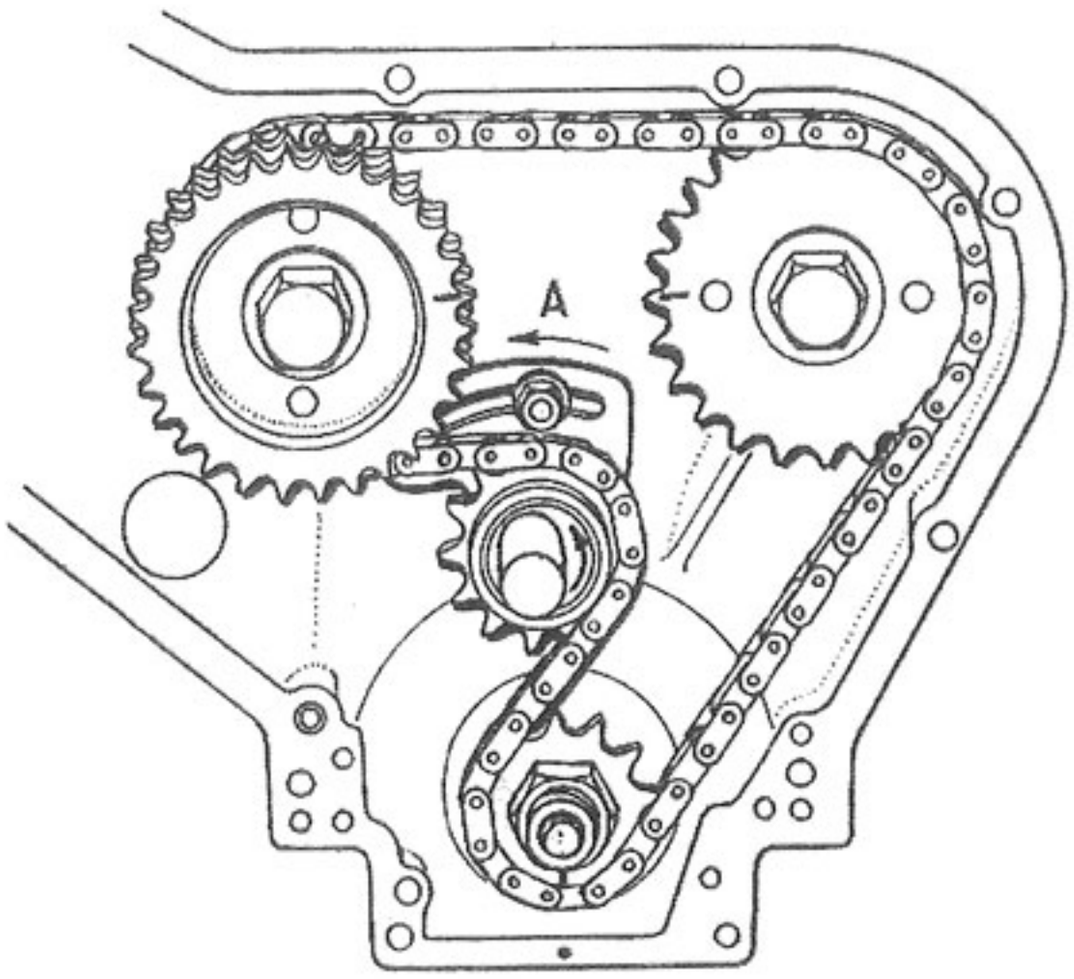
6. Timing Chain Adjustment

"500 Twin." Before adjusting the tension of the timing chain, turn the engine until the chain is in its tightest position and any slack is between the rear cam sprocket and the timing sprocket on the engine shaft.

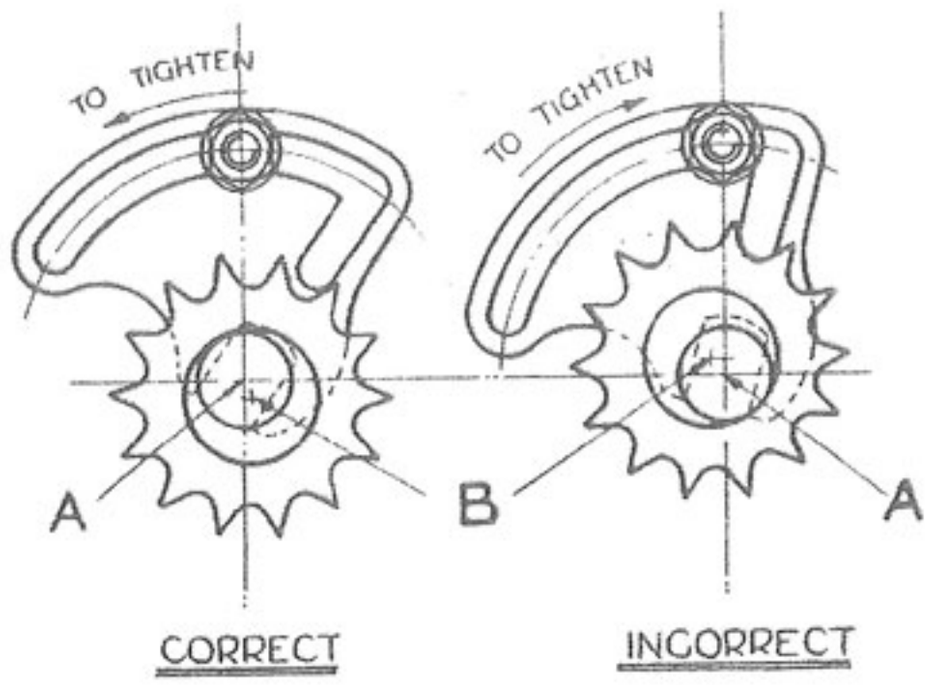
The tension of the timing chain is altered by moving the quadrant after slackening the nut which secures it. This rotates the eccentric spindle on which the chain tensioner jockey sprocket is mounted. Tightening of the chain is effected by moving the quadrant to the left.

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 diagram.)

In making the adjustment, care must be taken to see that any backlash in the quadrant is taken up in the "tightening" directions, i.e. do not make the chain too tight and then move the quadrant back slightly, but tighten the chain progressively



TIMING CHAIN ADJUSTMENT SHOWING TIMING MARKS
" 500 Twin "
Fig. 3



TIMING CHAIN ADJUSTMENT
" 500 Twin "
Fig. 4

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.

After the adjustment has been completed and the quadrant has been locked in position, turn the engine slowly and check the tension at frequent intervals to ensure that excessive tightening does not take place in any one position.

"Meteor 700." Before adjusting the tension of the timing chain, turn the engine until the chain is in its tightest position and any slack is between the rear cam sprocket and the timing sprocket on the engine shaft (see Fig. 5).

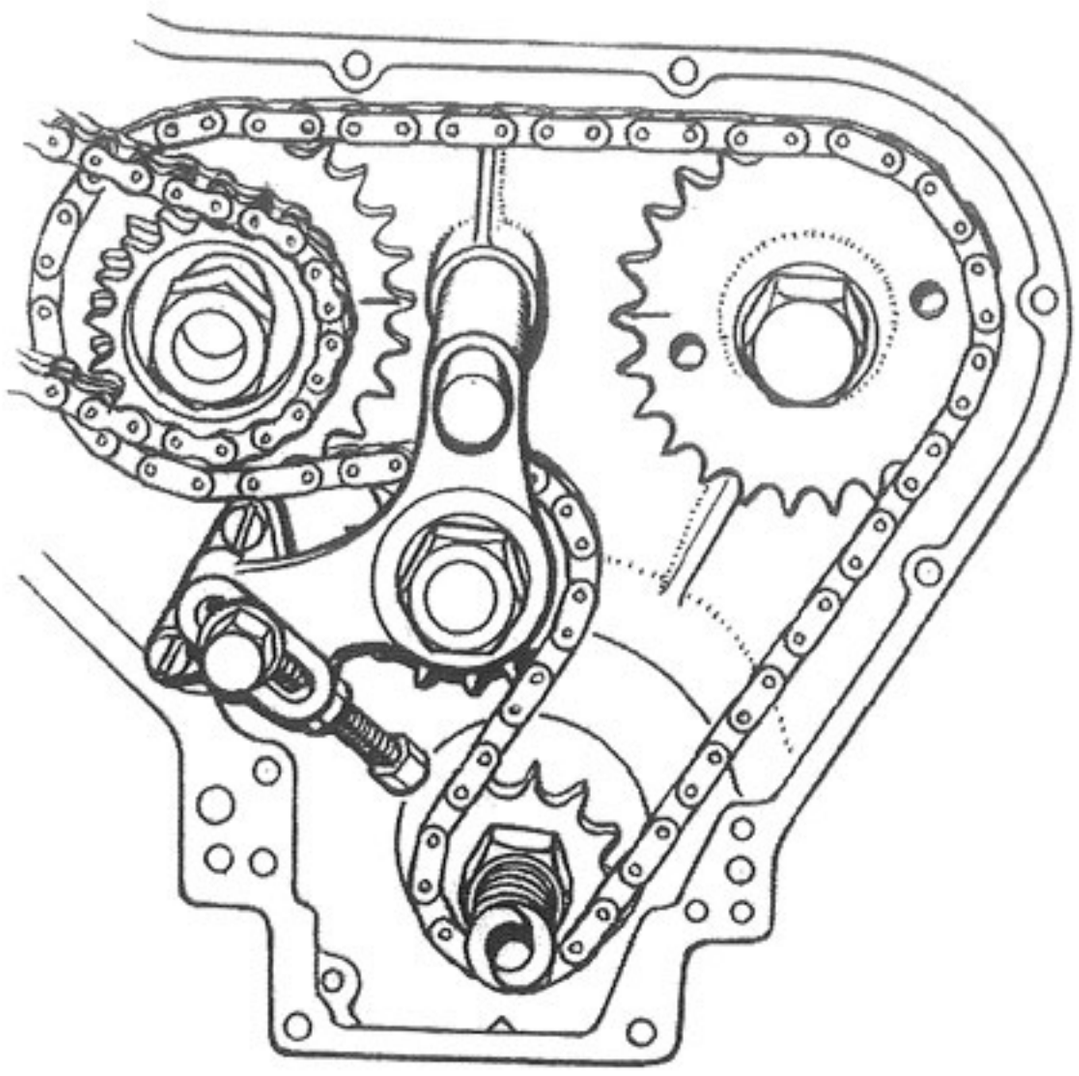
Slacken the securing bolt on the chain adjuster and the locknut on the adjusting screw. Turn the adjusting screw until the correct chain tension is obtained and tighten the locknut and securing bolt.

After the adjustment has been completed and the adjusting arm locked in position, turn the engine slowly and check the tension at frequent intervals to ensure that excessive tightening of the chain does not take place in any one position.

On some earlier models the chain tensioner incorporated a spring plunger. This can be replaced, if necessary, by the present design, which is interchangeable.

7. Magneto Chain Adjustment

To adjust the magneto chain tension, remove the timing cover (see Subsection 1), slacken the three magneto fixing bolts and loosen the bolster stud nut. Slide the magneto back until the chain has about 3/16 in. up and down movement, then tighten the fixing bolts.



TIMING CHAIN ADJUSTMENT
" Meteor 700 "
Fig. 5

On earlier "500 Twin" models no provision was made for adjusting the dynamo chain, but a slipper can now be provided, if necessary.

8. Removal of Dual Seat

Remove the nuts from the two fixing bolts securing the seat which can then be unhooked at the front and lifted off.

9. Removal of Petrol Tank

Turn off the petrol tap.

Disconnect the petrol pipe.

Remove the two bolts which secure the tank to the frame at front and rear and it can then be lifted clear.

10. Removal of Cylinder Head

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

The dual seat may also be removed if desired. (Subsection 8.) Remove the head steady bolt and bracket or the head steady.

Disconnect the oil pipes and plug leads.

Remove the exhaust pipes and carburettor and induction pipe.

Turn the engine until both valves are closed.

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

In replacing the head, see that the push rods are the right way up (shallow cups upwards). If steel push rods are fitted, the wide cup should be upwards.

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

Lower the cylinder head 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 re-checked.

11. Removal of Valves

Remove the rocker box covers, each held by four nuts, swing the rocker clear of the valve and lift or prise away the hardened steel thimble or end cap. If this has stuck, it can be removed by means of a screwdriver. Using a suitable valve spring compressor, 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 re-assembled with the valve from which they were removed.

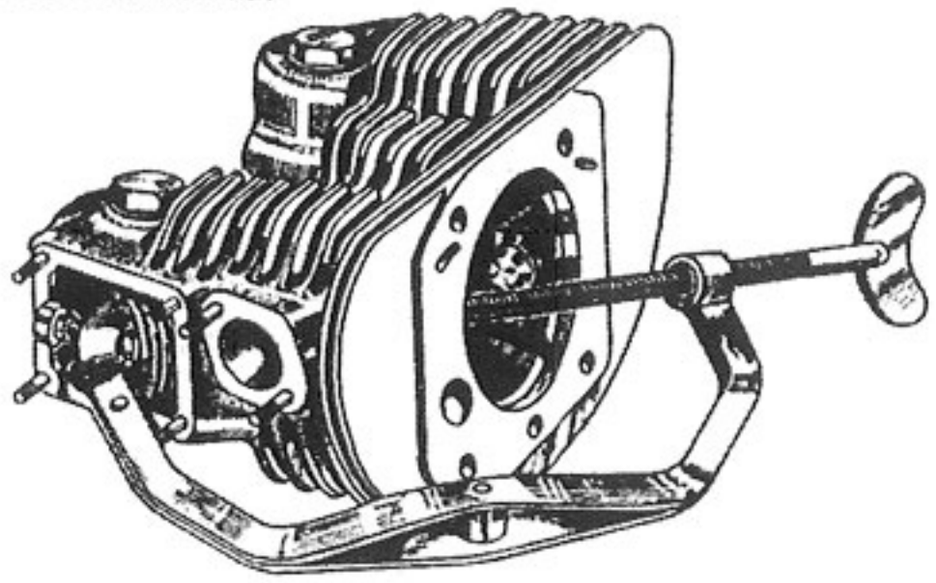


Fig. 6

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 Rockers.

Turn the engine so that the valve is closed.

Remove the oil pipe connection and plug from the cylinder head and the rocker spindle can then generally be withdrawn by means of a piece of rod inserted in the central hole.

If this is not successful remove the oil pipe plug on the opposite cylinder head and the two plugs between the heads and drive the rocker spindle out with a piece of rod passing through the rocker spindle in the opposite cylinder head.

On re-assembling, make sure that the spring washers are fitted on the insides of the rockers and the plain thrust washers on the outer sides.

13. Removal of 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 7/8 in.

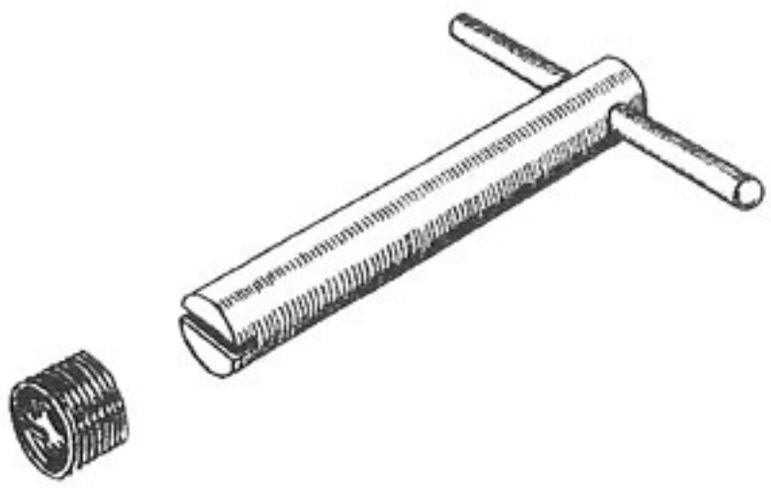
The second is a mandrel about 4 in. long, made from 9/16 in. diameter bar with the end turned down to about 5/16 in. diameter for 1/2 in.

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 9/16 in. internal diameter to prevent damage to the bore of the guide. It is necessary to re-cut the valve seat and grind in the valve after a guide has been replaced.

14. Renewal of Sparking Plug Inserts

A steel thread insert is fitted into each sparking plug bore to prevent damage to the threads in the alloy cylinder heads.



SPARKING PLUG INSERT AND SPECIAL TOOL
Fig. 7

This insert should not normally require renewal but if it does become damaged, for instance by a faulty plug, it can be pulled out with a pair of pliers and a new one fitted.

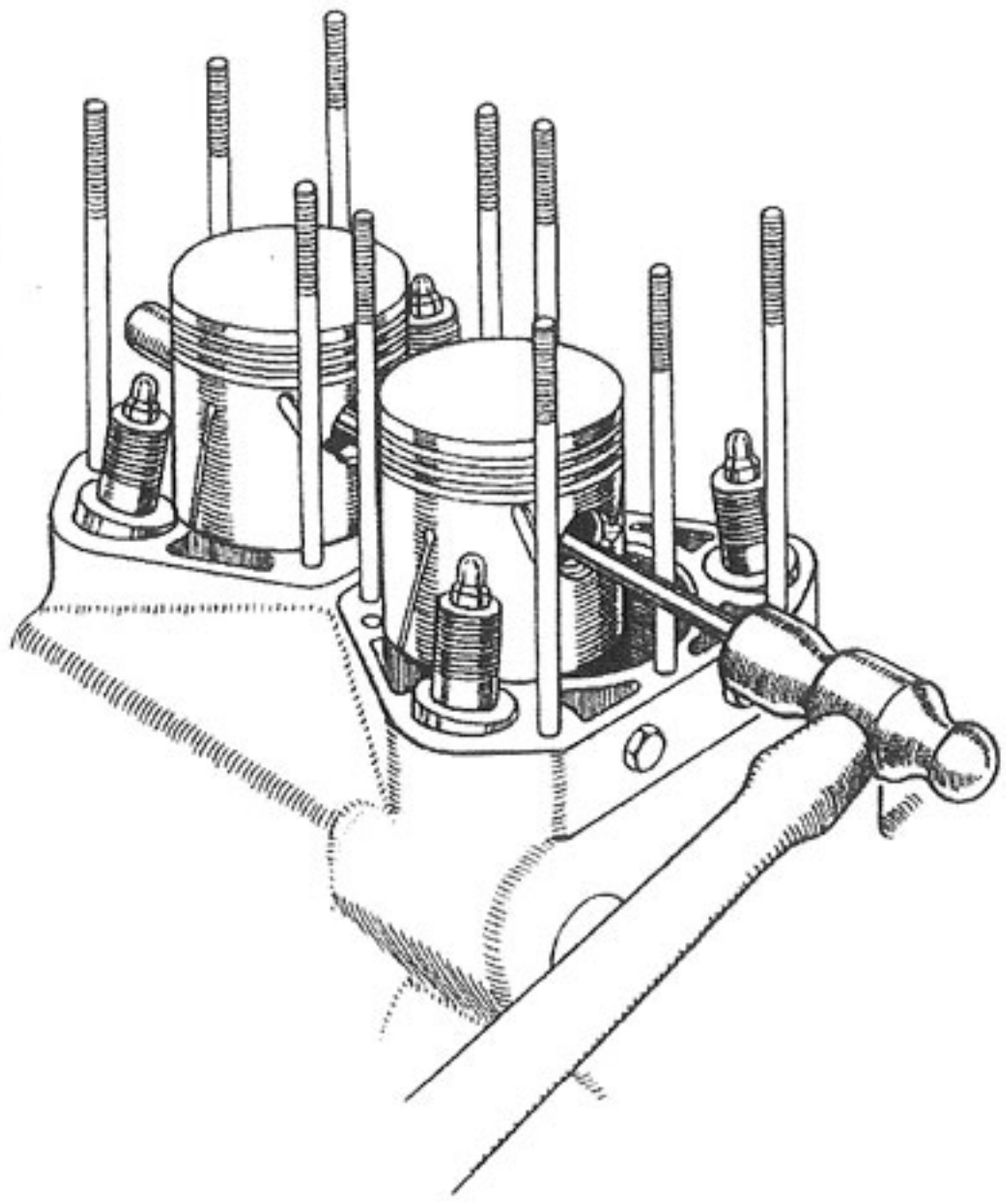
To fit a new insert a special tool consisting of a piece of 7/16 in. diameter tube or rod with a slot cut in the end is required.

The new 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 1.1/2 threads below the top face. A reverse twist of the tool will then break off the tag.

If the cylinder head has not been removed from the engine, 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.

15. Removal of Cylinders

When the cylinder heads have been removed the cylinders can be lifted clear off the studs.



REMOVAL OF PISTON
Fig. 8

This should be done with the pistons at bottom dead centre.

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

In the case of the "500 Twin" engine, see that there are the correct holes in the paper joint for the internal oil passages.

16. Removal of Pistons

Remove the cylinder heads and cylinders. With the tang of a file remove one of the wire circlips retaining the gudgeon pins. If necessary rotate the engine slightly until the pistons are in such a position that the gudgeon pins will clear the long cylinder studs when being withdrawn.

Use Special Tool No. E5477 to extract the gudgeon pin or using a rod about 1/4 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 mouth 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 face which beds down on to the head gaskets.

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

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 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

Wipe the valve faces clean and examine them carefully. If they are at all pitted, have the faces re-cut. Pay similar attention to the valve seats in the head; excessive grinding will form a pocket and the gas flow will be restricted. The angle of the valve face should be 45 degrees to the axis of the valve stem.

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. Frequently lift the valve and move it round so that an even and true seating is obtained. Continue grinding until a bright ring is visible on both valve and seating.

19. Re-assembly 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.

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; in the case of the 500c.c.engine, make sure that each has two holes which register with the oil passages.

Smear clean oil over the pistons and space the ring gaps, 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 heads, shallow cups upwards. (Or wide cups upwards in the case of steel rods.)

Fit the copper cylinder head gaskets and replace the cylinder heads as described in Subsection 10.

After the engine has been assembled, run it for a brief period with the ignition fully advanced.

When 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 in the return oil circuit and is located in the oil tank at the back of the crankcase.

The filter element is removed by unscrewing the nut holding the end cap in position. When re-assembling the filter after cleaning, take care that no grit or other foreign matter is sticking to it.

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.

On some models the oil filter is in the oil feed to the big ends instead of the return circuit and is located in the bottom of the timing cover instead of in the oil tank.

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; the plungers 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. The latter should be held 1/8 in. off the timing cover if the springs are correct.

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

Re-assemble 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 oilcan. 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.

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 and 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 push rods.

The pump drive is by means of a double-start worm so that the pump runs at 1/6 engine speed.

On earlier models a single-start worm was used, giving a pump speed of 1/12 engine speed.

The two are interchangeable but, if a singlestart worm is replaced by a double-start worm, the pump spindle must also be changed or damage will be caused.

On the pump spindle mating with the doublestart worm the tooth angle is 6.1/2° to the axis of the shaft, while in the case of the single start it is 3.1/4°.

22. Removal of Timing Chains

"Meteor." Loosen the magdyno fixing bolts.

Remove the magneto sprocket. (See Subsection 25.)

Lift the magneto chain off the cam sprocket.

Remove the chain tensioner securing bolt and the anchor plate held by two screws.

Withdraw the chain tensioner fulcrum pin.

Remove the chain tensioner arm and sprocket. Lift the chain off the cam sprockets.

"500 Twin." Loosen the magneto fixing bolts.

Remove the magneto sprocket. (See Subsection 25.)

Lift the magneto chain off the cam sprocket.

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 sprocket.

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. **Do not attempt to withdraw the sprocket by tapping the worm, as this will dislodge the locking nut in the crankshaft.** (See Section D.1, Subsection 7.)

24. Removal of Camshaft Sprocket

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 Magneto Sprocket

Magdyno. The sprocket is mounted on a smooth taper on the magneto shaft and is held in position by a nut **(Right Hand Thread).** To

remove the sprocket, undo the nut and use a Magdyno sprocket extractor-Special Tool No. 14835.

Dynamo. In the case of engines fitted with coil ignition the sprocket can be withdrawn by means of a dynamo sprocket extractor-Special Tool No. E.5127.

26. Removal of Engine and Clutch Sprockets

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

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

To remove the clutch sprocket unscrew the three clutch spring pins and lift away the spring cap, springs, distance pieces, clutch front plate, centre retaining ring and the assembly of driving and driven clutch plates. The clutch sprocket can then be withdrawn from the centre after 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 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.

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 ins. 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.

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

28. Dismantling the Breather

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 discs and backplate are clean and undamaged and that the discs are seating properly.

When re-assembling the breather, apply jointing compound sparingly to the back of the steel plate taking great care to keep it away from the discs or their seatings.

On earlier models fibre discs were used in the breather, without a backplate. If the fibre discs are re-placed by steel discs, the steel backplate must be fitted to prevent wear on the surface of the alloy casting.

On very early models of the "500 Twin" the breather was located in the end of the crankshaft with a cork seal to prevent breathing into the chaincase.

29. Removal of 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 Final Drive Sprocket

Remove the clutch as described in Subsection 29.

Remove the primary chain tensioner.

Remove the rear half of the primary chain case 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 Bearing Housing Felt Washer

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

The felt washer is located in the steel housing at the back of the chain case.

Great care must be taken not to nip the felt washer behind the sprocket on re-assembly as this would make the engine very stiff to turn over and would damage the washer and allow leakage from the crankcase.

32. Oil Pipe Unions

"Meteor." 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 in the crankcase are fitted with steel wire thread inserts to prevent the threads in the aluminium from stripping.

Those in the cylinder heads are not provided with thread inserts because they are not so liable

to damage but, if they should become damaged, the same wire insert that is used in the crankcase can be fitted by cutting a thread with a special tap.

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

"500 Twin." The oil pipe bosses on the "500 Twin" are on the base of the cylinder barrels and not on the crankcase and wire inserts are not therefore necessary.

33. Pressure Relief Valves

There are two pressure relief valves in the oil feeds to the big ends and to the rocker gear respectively. Their function is to prevent excessive pressure and their setting is not critical.

They are set before leaving the Works and should not normally require to be disturbed. If, however, it is found necessary to dismantle either of them, they can be reset as follows:

Rocker Feed Relief Valve. This is located in the crankcase face behind the timing cover and consists of a 3/16 in. diameter steel ball held in position by a spring and brass plug. If the plug is screwed in until it is flush with the face of the crankcase, the pressure will be relieved at approximately l0 lbs. per square inch. The plug is prevented from moving by peening over the aluminium into the screwdriver slot with a small centre punch.

Big End Feed Relief Valve. This is located in the inside of the bottom of the timing cover and consists of a 1/4 in. diameter steel ball and a spring and plug. It should be set to relieve the pressure at approximately 60 lbs. per square inch.

The pressure can be measured by applying an air line with a pressure gauge (or a suitable force feed oil gun) to the oil feed plug in the timing cover which fits into the pump worm.

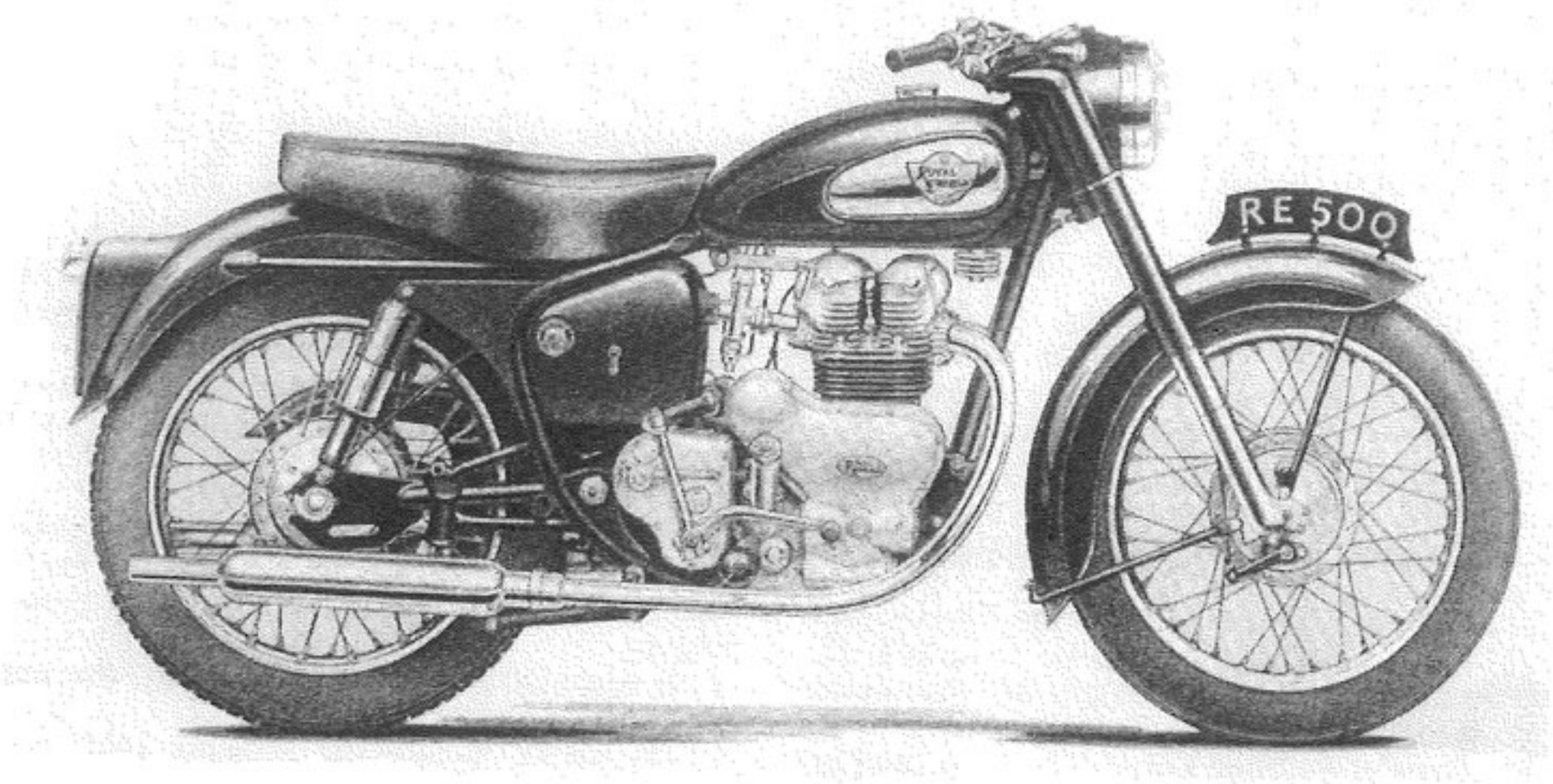
Rotate the pump spindle by means of a screwdriver until the ports are sealed by the pump disc. The ports are sealed when no leakage occurs on the timing cover face.

Turn the relief valve plug until the pressure at which the valve opens is about 60 lbs. per square inch, then secure the plug by peening as above.

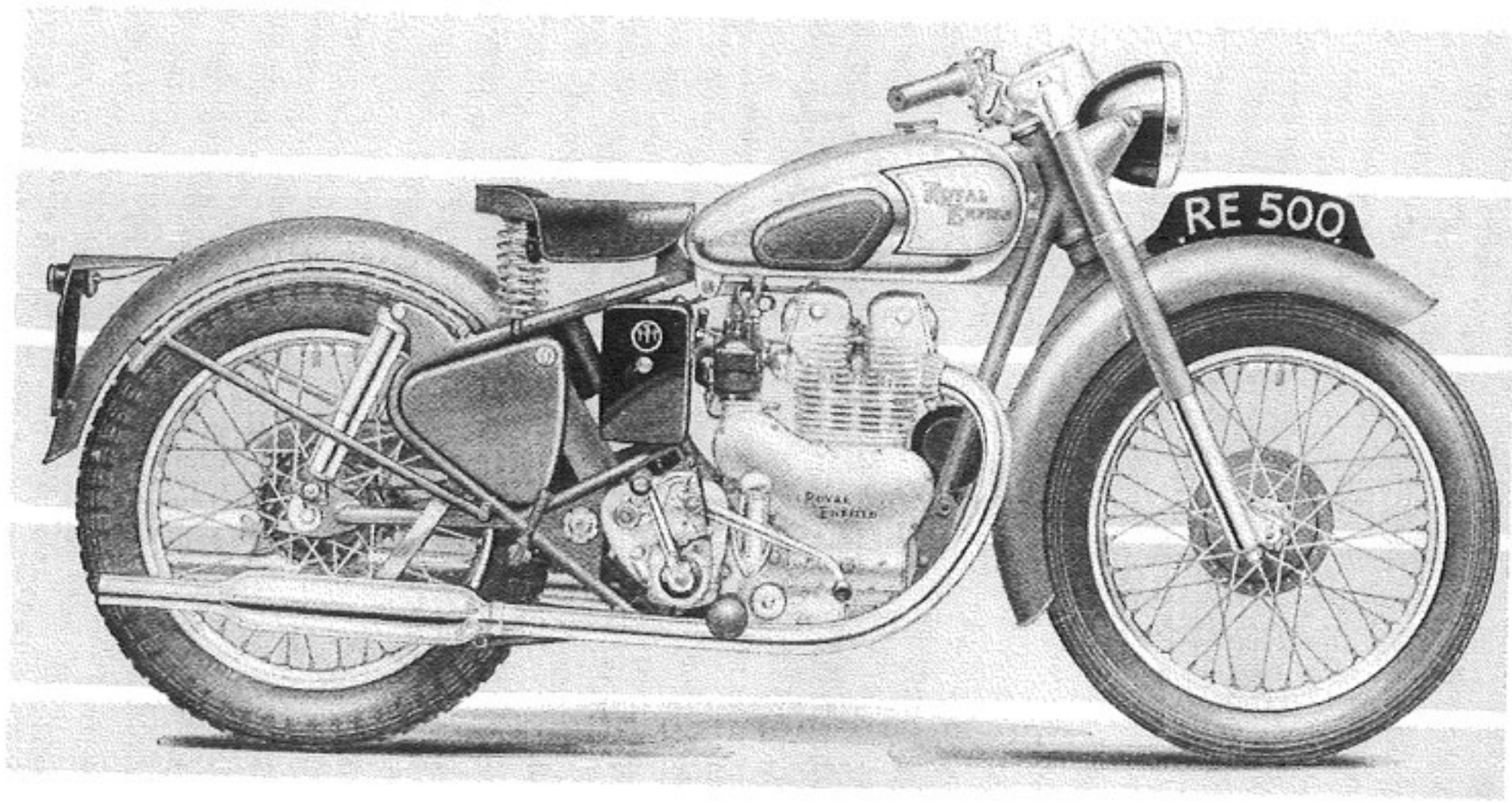
If too high a pressure is applied, the pump disc will be forced off its seating.

On earlier models the pressure relief valve for the oil supply to the big ends was in the crankshaft. Some trouble may be caused by dirt under the ball causing the valve to stick. If so desired, the relief valve can be removed and the oil passage blanked off and the new type of timing cover fitted.

ROYAL ENFIELD WORKSHOP MANUAL



500 TWIN 1957



500 TWIN 1950

SECTION D1

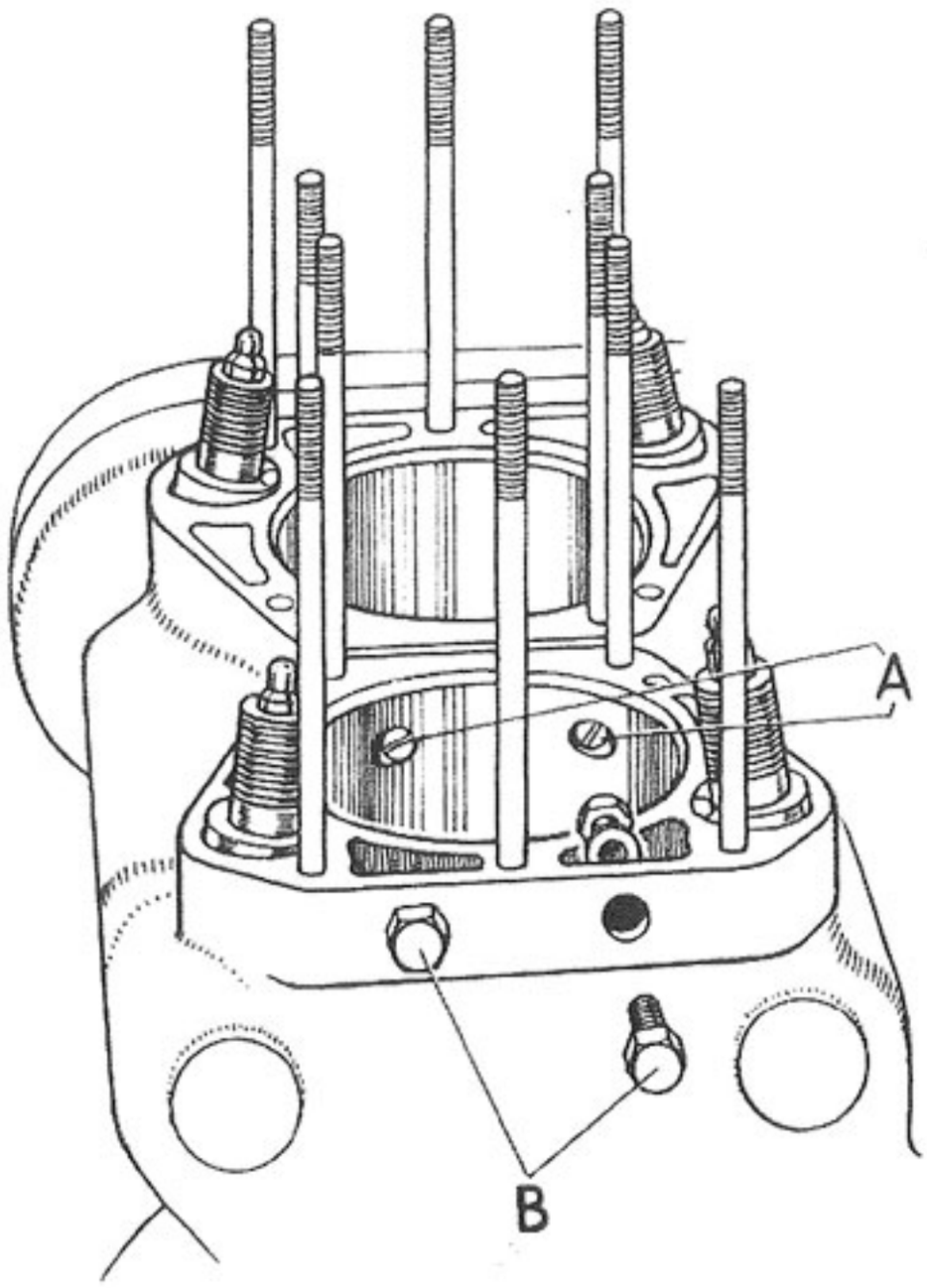
Service Operations with Engine Removed

" Meteor 700" and "500 Twin"

1. Removal of Engine from Frame

Disconnect the battery leads and remove the battery.

Remove the dual seat and petrol tank.
Remove the engine steady brackets.
Remove the air cleaner and battery carrier.
Remove the exhaust pipes.
Disconnect the electric horn leads.
Disconnect the magneto and dynamo leads.
Remove the slides from the carburettor.
Remove the rear chain and chain guard.
Remove the bolts from mudguard bracket at rear of gearbox.



REMOVAL OF SCREWS IN CRANKCASE
Fig. 1

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 nut and swing the lower engine plate down.
Remove the front engine plates and horn.
Remove the nuts from the top bolt of the rear gearbox plates and then remove the timing side gearbox plate. The engine can then be swung out on the right hand side.

Alternatively, if the engine is to be stripped, remove the primary chain case cover, the engine sprocket and clutch and the back of the primary chaincase. The top rear engine bolt can then be withdrawn without disturbing the rear gearbox plates.

2. Removal of the Gear Box

Remove the engine sprocket (Section C.1, Subsection 26) and clutch (Section C.1, Subsection 29).

Remove the rear half of the primary chain case 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.1.

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 unless the driving side cylinder has been or is to be lifted because they cannot be tightened without holding the nuts inside).

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.)

The two halves of the crankcase can now be separated.

The inner race of the roller bearing 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 fitting 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 bearing 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 progressively with a torque wrench set at 200-220 inch-lbs.

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 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.

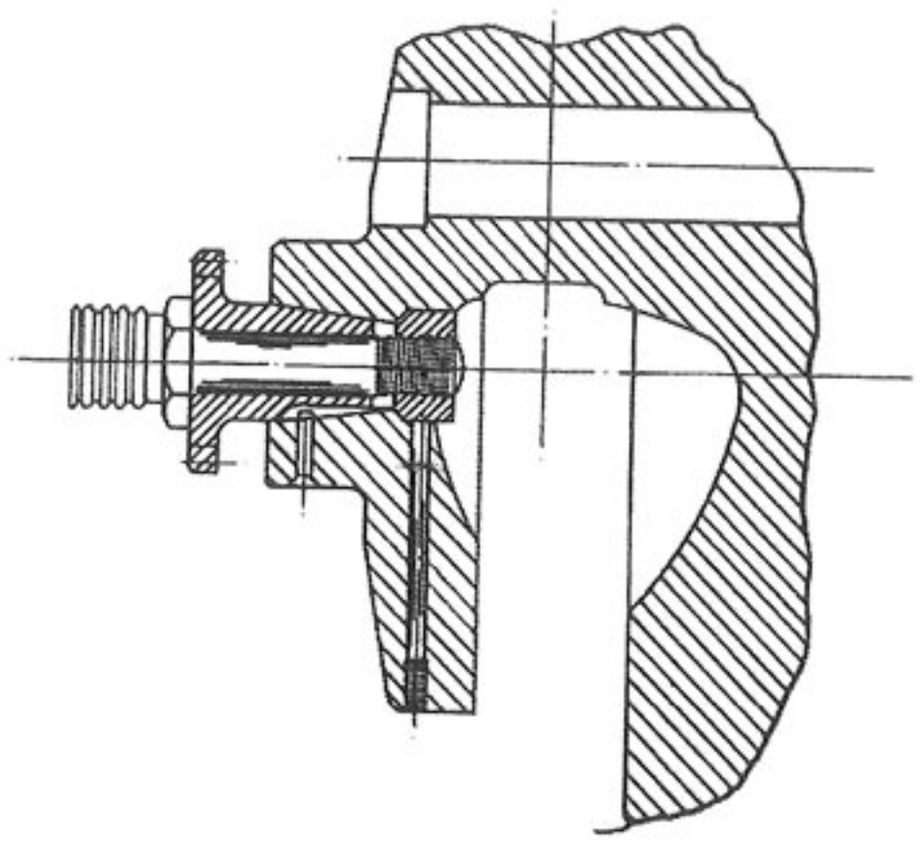
White-metalled steel liners are fitted in the connecting rods and these are replaceable.

6. Re-assembly 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 to the crankshaft as described in Subsection 4.

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.



SECTION SHOWING LOCKING OF OIL PUMP WORM AND TIMING SPROCKET BY LOCKING ROD.

PUMP WORM LOCKNUT

Fig. 2

Insert the camshafts in their correct position (exhaust front, inlet rear) and see that the filter housing is in position.

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

Apply 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 crankcase should now be drawn into its correct position by fitting the engine sprocket

temporarily and tightening the nut whilst the crankcase is still hot.

7. Pump Worm Locknut

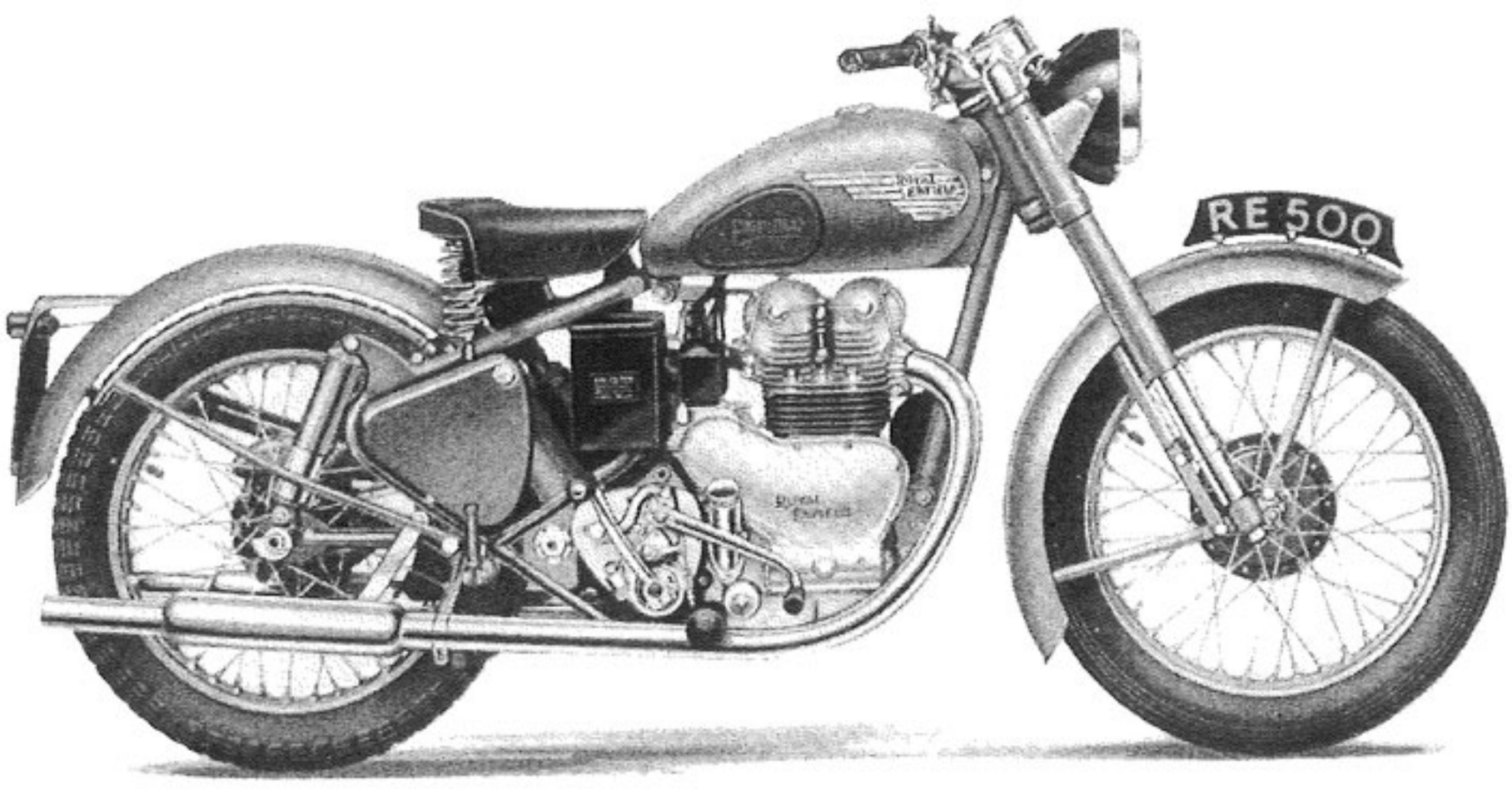
The pump worm is held in position in the end of the crankshaft by a steel nut which is permanently fixed in the crankshaft and should not be removed.

The nut is fitted in a recess and locked by means of a long peg which in turn is held by a grub screw in the timing side crank web.

If it is necessary to re-fit the nut, assemble the timing sprocket with the pump worm and nut in the crankshaft while out of the crankcase and tighten it up.

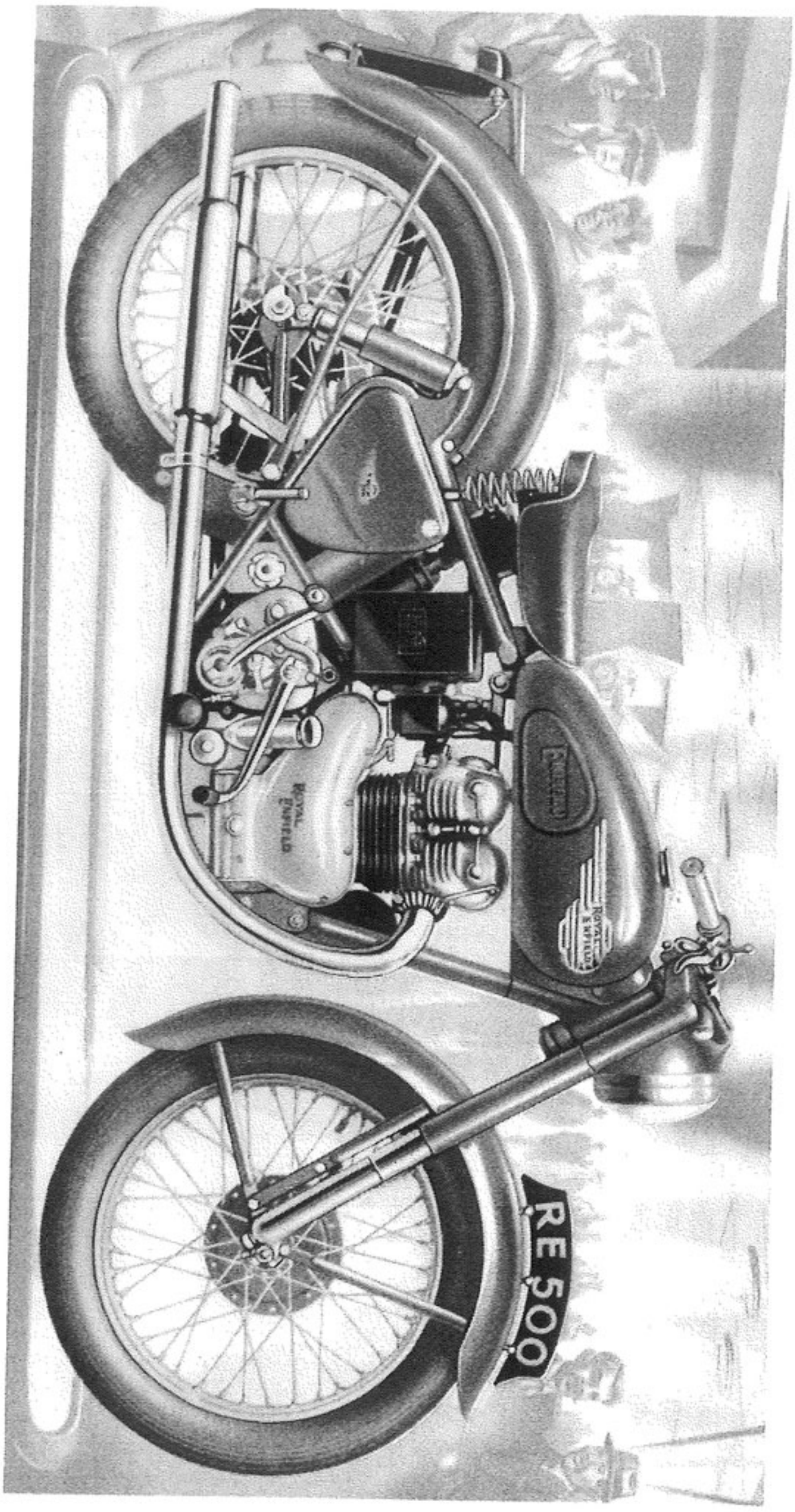
By means of a long drill through the hole in the crankshaft web, countersink the nut to about 1/8 in. Insert the locking rod and grub screw.

Remove the pump worm and sprocket and re-assemble after the shaft has been fitted in the crankcase.



500 TWIN 1953

ROYAL ENFIELD WORKSHOP MANUAL



SECTION E1

Gearbox and Clutch

" Meteor 700" " 500 Twin " " 500 Bullet" " 350 Bullet"

1. Removal of Gearbox

This is described in section Cl or D1. The gearbox can, however, be completly dismantled with the engine in the frame except for removal of the inside operator and the bearings in the gearbox shell.

2. To Dismantle the Gearbox

First remove the kickstart crank, the gear changelever and the neutral finder and pointer.

Remove the top small inspection cover and disconnect the clutch cable.

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

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

Remove the main shaft bearing cover which is attached by two screws.

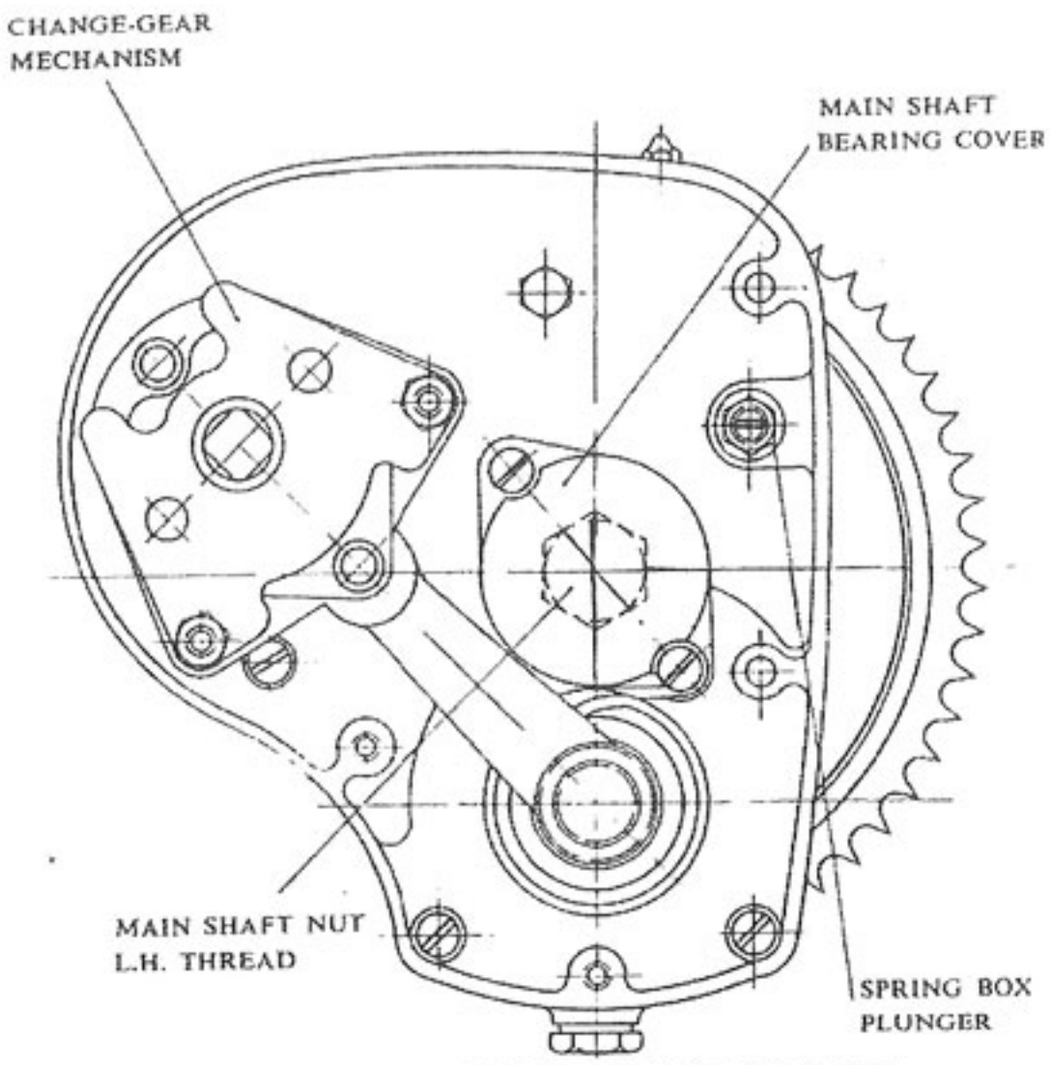
Remove four cheese-headed screws and hexagon bolt.

Remove the spring box locating plunger nut and washer.

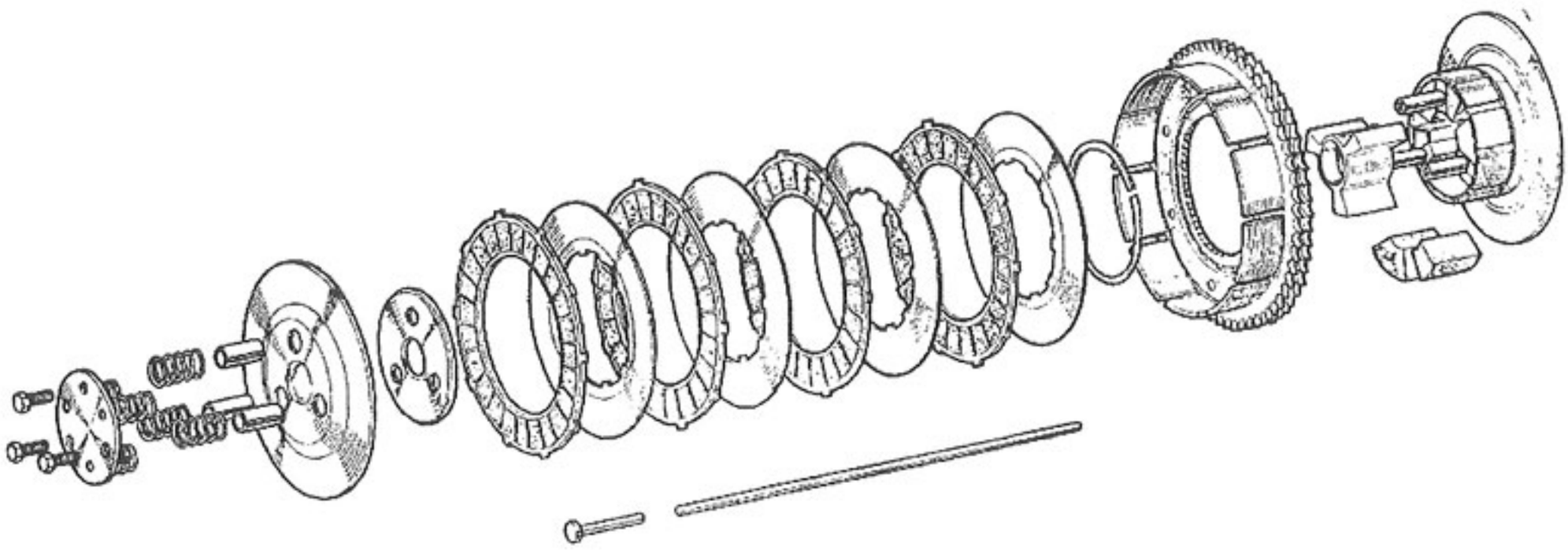
Remove the main shaft nut **(Left Hand Thread).**

The gearbox inner cover can then be removed

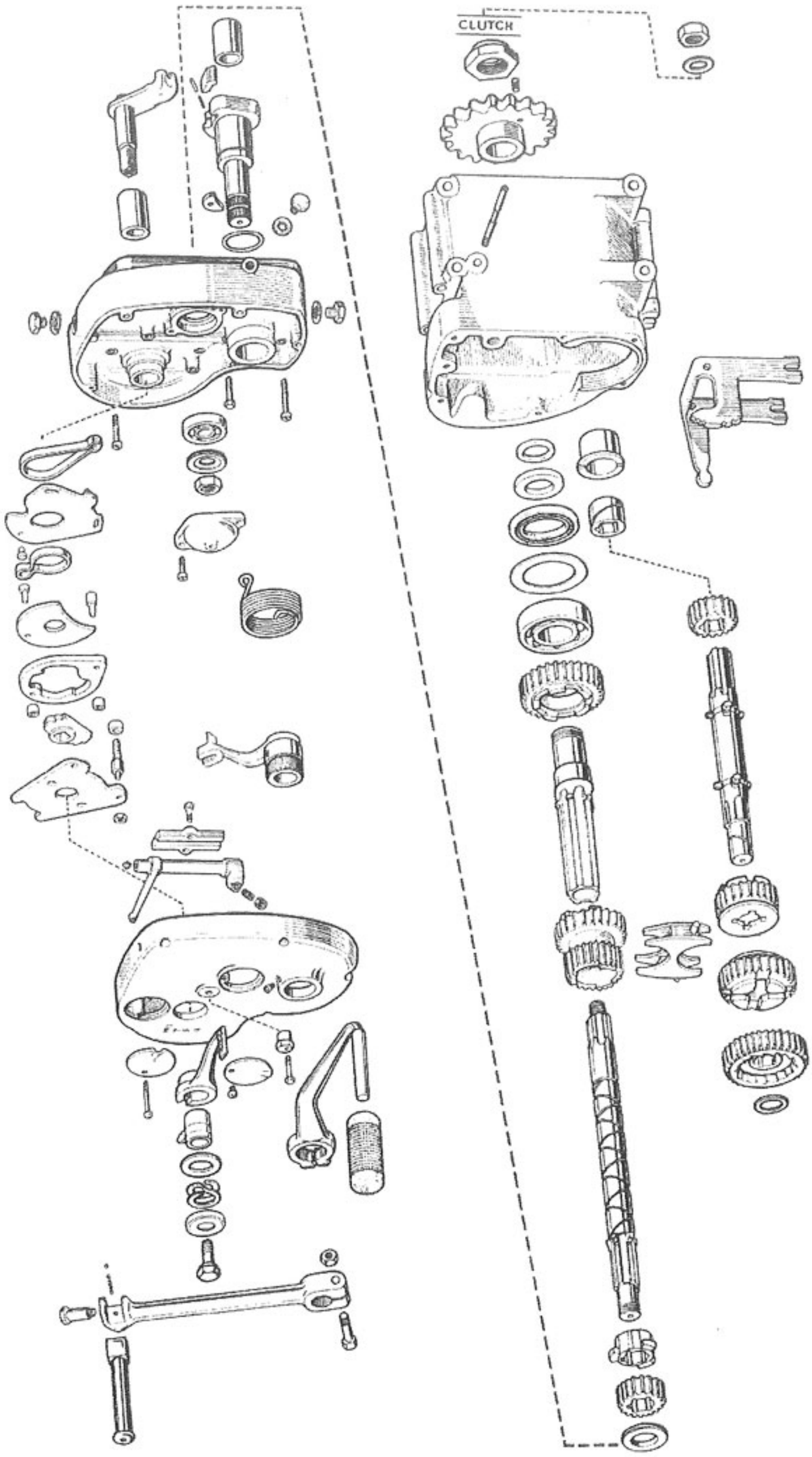
The mainshaft can be drawn straight out if the clutch has been removed, which, however, should be done before taking off the gearbox cover.



GEARBOX WITH OUTER COVER REMOVED
Fig. 1



EXPLODED VIEW OF CLUTCH
Fig. 2



EXPLODED VIEW OF GEARBOX
Fig. 3

(See Section C1 or D1.) 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 C1 or D1.)

3. Removal of the Ball Races

The mainshaft ball bearings can be removed by using a stepped drift 1.7/16 in.–1.11/64 in. diameter for the bearing in the box and 13/16 in.-39/64 in. diameter for the bearing in the cover.

When refitting the bearings stepped drifts of 2.5/16 in.-1.11/64 in. diameter and 1.11/16 in.-39/64 in. diameter must be used for the bearings in the box and cover respectively.

Note the felt washer in the recess behind the larger main shaft 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 main shaft 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 sprocket.

4. Gear Change Mechanism

If the two nuts securing the gear change 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.

5. Re-Assembling the Gearbox

The procedure is the reverse of that given in Subsection 2 but the following points should be noted:

If the main shaft 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 main shaft 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 gear oil. (See Subsection 9.) On no account must heavy yellow grease be used.

6. Dismantling and Re-assembly of the Clutch

The method of removing the clutch is described in Section C1 or D1.

When re-assembling, note that two of the steel plates are dished and that the other(s) are flat. The correct order of assembly is shown on the exploded drawing.

Do not forget to replace the cush rubber plate retaining cover before fitting the pressure plate.

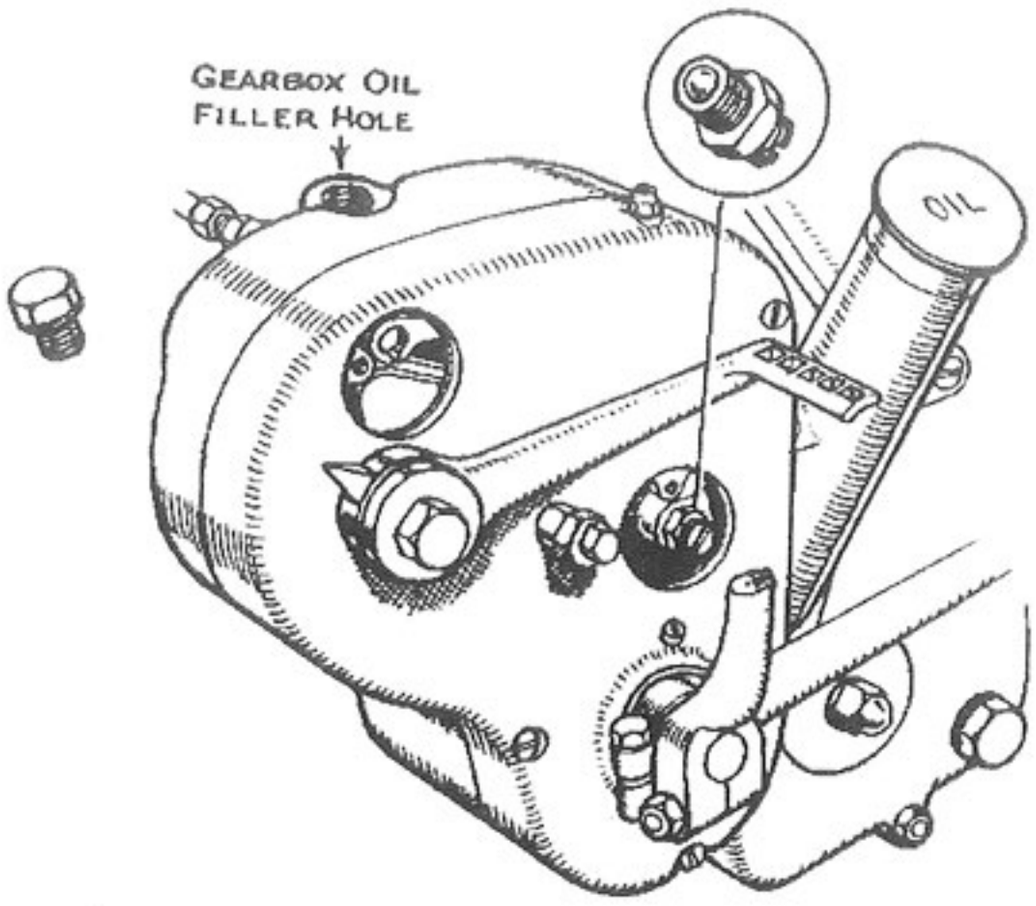
Make sure that the distance tubes inside three of the springs pass through the holes in the pressure plate. The other three springs are located by means of bosses on the clutch cap.

Tighten the spring 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.

7. Adjustment of the Clutch Control

It is essential that there should be about 1/16 in. free movement in the clutch cable, to ensure that all the spring pressure is exerted on the plate.

There are two points of adjustment for the clutch cable. The first is at the top of the gearbox just behind the oil filler plug and is provided for taking up any stretch in the cable. The adjustment is made by screwing the collar in or out of the gearbox shell. The connection between the end of the cable and the horizontal lever can be seen if the top small inspection cover on the front of the gearbox is removed. Tighten the locknut on the screwed collar after adjustment has been made.



CLUTCH ADJUSTMENT ON CURRENT GEARBOXES
Fig. 4

The other point of adjustment is behind the lower inspection cover on the front of the gearbox and is for compensating for wear on the clutch plate inserts. To make the adjustment, remove the inspection cover, slacken the locknut and turn the central screw. Tighten the locknut after adjustment has been made.

The reason for the two points of adjustment is to enable the lever behind the cover to be kept in its proper position whether the need for adjustment is caused by plate wear or cable stretch.

Owing to initial bedding down of the clutch plate inserts, the clutch control may require adjustment after the first few hundred miles with a new machine. This point should therefore be examined soon after delivery and adjustment made if necessary.

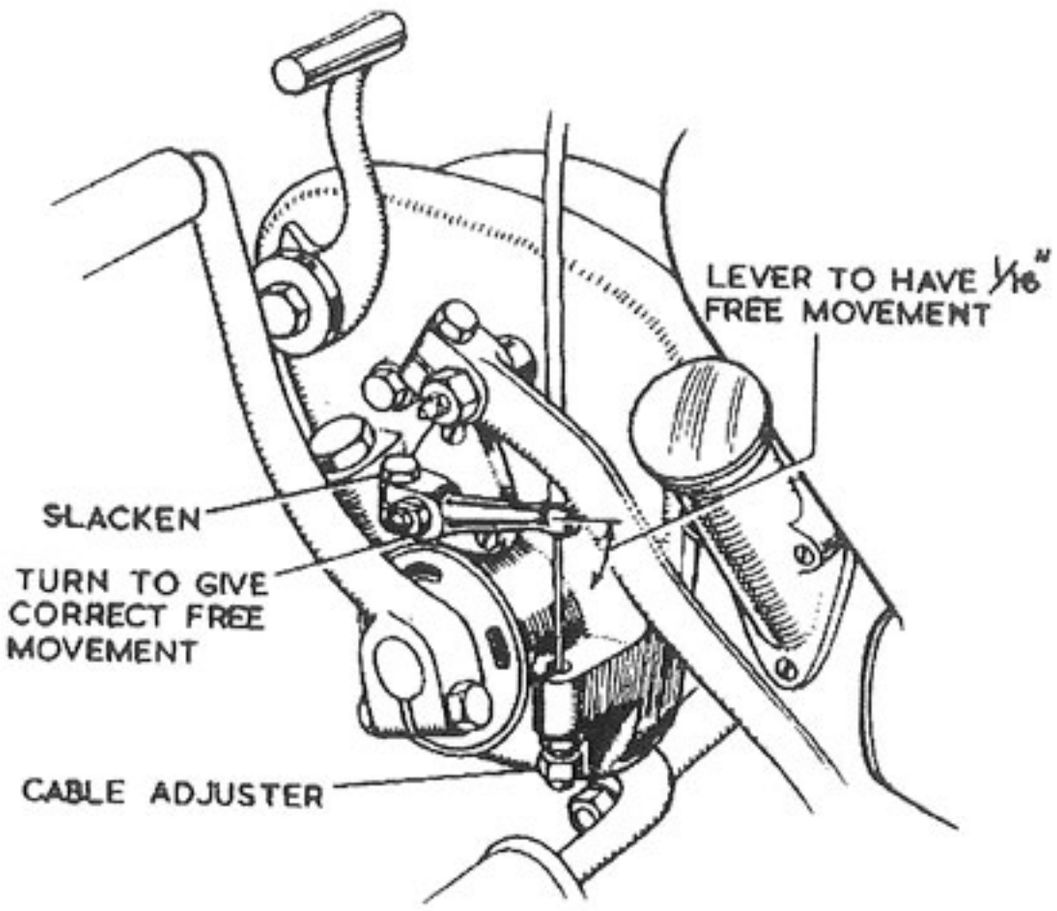
On earlier models the clutch operating mechanism is exposed on the front of the gearbox, but the adjustments are, however, the same in principle as those described above.

The cable adjustment is at the bottom of the front of the gearbox just in front of the kickstart lever. The collar is screwed in or out of a lug on the gearbox cover and is secured by a locknut as before.

The other adjustment is made by slackening the clamping bolt in the horizontal lever and turning the lever on its spindle, which is the end of the operating worm in the gearbox cover.

When correctly adjusted, the lever should be approximately square with the cable when the clutch is fully lifted.

The position of the lever endwise on the worm spindle is important and it should be positioned so that it does not foul the kickstart lever.



CLUTCH LEVER AND CABLE ADJUSTMENTS ON EARLY GEARBOXES
Fig. 5

8. 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 stop until the correct movement of the pedal is obtained.

9. Gearbox Oil Level

The gearbox is replenished 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 right hand side looking at the cover.

On earlier models a dip-stick is attached to the filler plug for measuring the level of the oil or was provided loose in the tool kit.

On some models the filler plug is on the side of the gearbox and in such cases the oil should be level with the plug hole and no dip-stick is required. The oil will be found to run into the box more easily on these models if the engine is started up and allowed to tick over so that the gears and shafts rotate.

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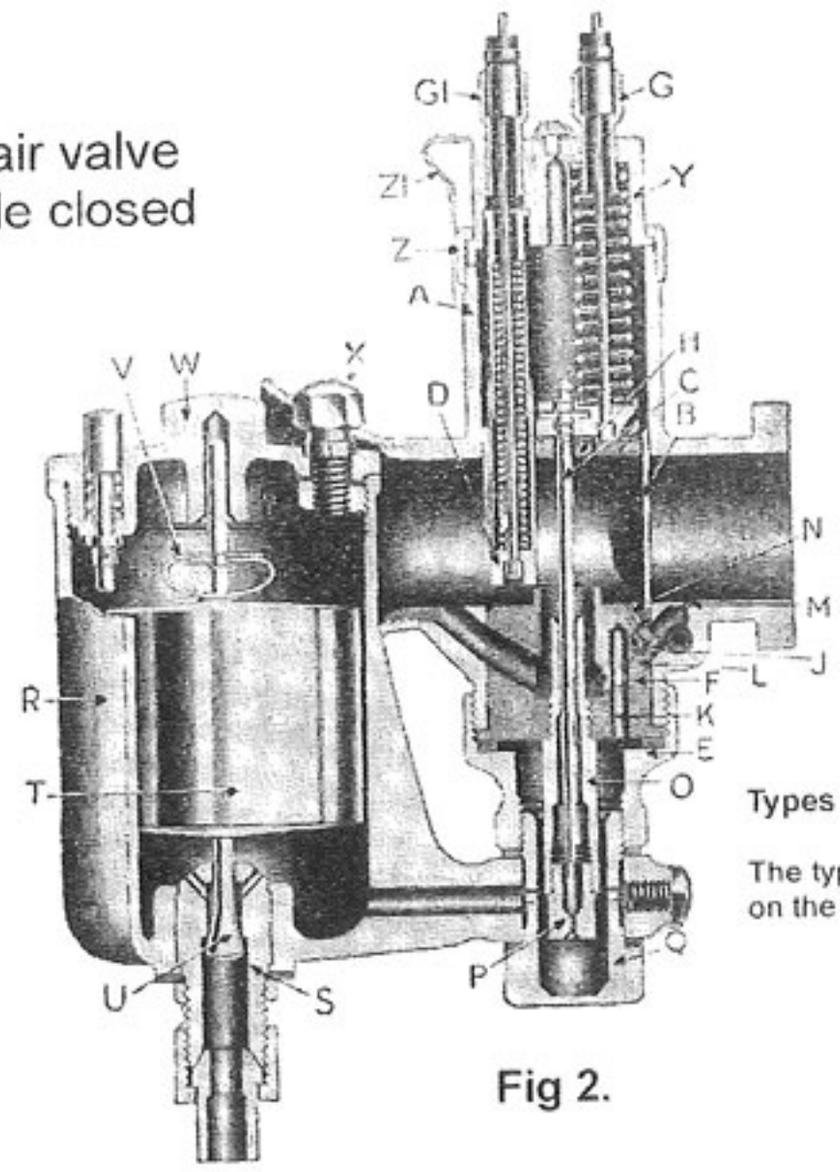
AMAL NEEDLE TYPE CARBURETTER

MODEL	YEAR	CARB NUMBER	CHOKE DIAMETER	MAIN JET	NEEDLE JET	NEEDLE POSITION	THROTTLE VALVE
500 TWIN	1948-55	276DJ/1AT	15/16	150	109	3	4
500 TWIN	1955-56	276GQ/1AT	15/16	150	109	3	4
500 TWIN	1957	376/36	15/16	230	106	3	3.1/2
700 METEOR (COIL IGN)	1953-55	276FJ/1AT	1.1/16	170	106	3	4
700 METEOR (MAG/DYNO)	1955	276GR/1AT	1.1/16	170	106	3	4

CARBURETTER WITH PILOT JET SYSTEM

Showing air valve and throttle closed



Types 274, 275, 276 and 289

The type numbers are found on the engine connection

Fig 2.

Your carburetter may be vertical, inclined or horizontal, but diagrammatically this view applies to all models, the variation being in the attachment to the engine and of the float chamber.

TWO DESIGNS

Fig. 2 above is the sectioned view of the standard Amal carburetter as shown on sheet 1, figure 1. This is the standard design where the primary air to the main jet and the pilot jet system comes in jointly through the main air intake, see figure 3, sheet 3. The type numbers are 274, 275. 276 and 289.
An alternative design is made where the primary air to the main jet comes in through four visible ports around the base of the mixing chamber, and where also the air supply to the pilot jet system is separate. The type numbers of these carburetters are 74, 75, 76, and 89.

These tuning instructions apply to both the above designs.

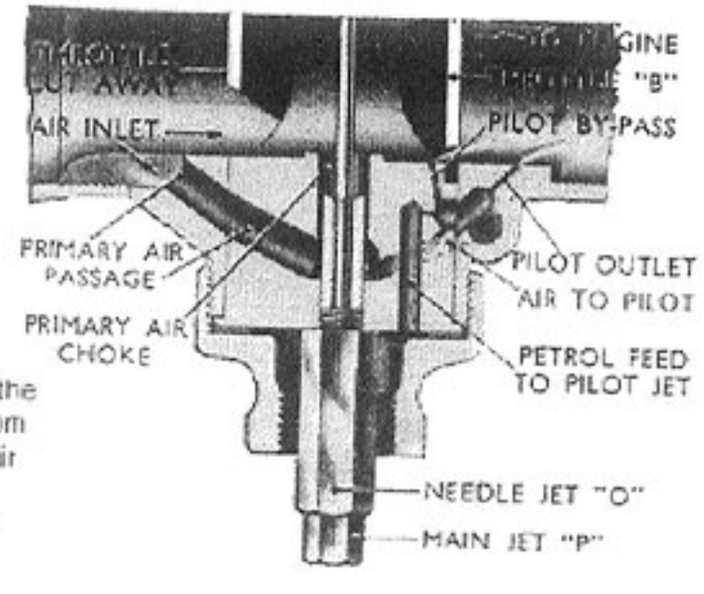
HOW IT WORKS AND PART NAMES

A. Mixing Chamber
B. Throttle Valve (see sheet 6)
C. Jet Needle and Clip above
D. Air Valve
E. Mixing Chamber Union Nut
F. Jet Block
G. Cable Adjuster (Throttle)
GI. Cable Adjuster (Air)
H. Jet Block Barrel
J. Pilot hole (see sheet 6)
K. Passage to Pilot
L. Pilot Air Passage
M. Pilot Mixture Outlet
N. Pilot By-pass
O. Needle Jet
P. Main Jet (see sheet 6)
Q. Float Chamber Holding Bolt
R. Float Chamber
S. Needle Valve Seating
T Float
U. Float Needle Valve
V. Float Needle Clip
W. Float Chamber Cover
X. Float Chamber Lock Screw
Tickler (to left of W.)
Y Mixing Chamber Top Cap
Z. Mixing Chamber Lock Ring
Z1 Security Spring for above

The carburetter proportions and atomises the right amount of petrol with the air that is sucked in by the engine because of the correct proportions of jet sizes and the main choke bore. The float chamber maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.
The throttle control from the handlebar controls the volume of mixture and therefore the power, and at all positions of the throttle the mixture is automatically correct. The opening of the throttle brings first into action the mixture supply from the pilot jet system for idling, then as it progressively opens, via the pilot by-pass, the mixture is augmented from the main jet, the earlier stages of which action is controlled by the needle in the needle jet. The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol air mixture through the primary air choke into the main air choke. This primary air choke has a compensating action.
The carburetters usually have a separately-operated mixture control called an air valve, for use when starting from cold, and until the engine is warm; this control partially blocks the passage of air through the main choke.
This design of carburetter offers perfectly simple and effective tuning facilities.

Fig 3.
This section view does NOT apply if your carburetter has FOUR EXTERNAL primary air holes at the base of the mixing chamber. It is for carburetters with the primary air inlet in the main air intake.

Diagrammatic section of carburetter showing only the lower half of the throttle chamber with the throttle a little open and the internal primary air passages to the main jet and pilot system



If the carburetter should flood whilst the engine is not running, the overflow from the main jet will run into the primary air passages and trickle out from there through a small hole seen at the side of the carburetter body.

HINTS AND TIPS

STARTING *from cold*. Flood the carburetter by depressing the tickler sharply three or four times, and close the air valve: set the ignition, approximately half retarded. Then shut the throttle and open it a little, eg: about one eighth open, see diagram on sheet 7 position 2, then kick-start. If it is too much open starting will be difficult.
STARTING, *engine hot*. Do not flood the carburetter, but close off the air lever. Set the ignition and close the throttle, then open the throttle about one eighth of its travel and kick-start. If the carburetter has been flooded and won't start because the mixture is too rich - open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle one eighth open, and air lever wide open. Generally speaking it is not advisable to flood at all when an engine is hot.
STARTING, *general*. By experiment, find out if and when it is necessary to flood, also note the best position for the air lever and the throttle for the easiest starting. (some carburetters have the throttle stop fitted with a starting position on to which the throttle must be shut down).

CABLE CONTROLS. See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open: this is done by the adjusters on the top of the carburetter. See that the throttle shuts down freely.

PETROL FEED, verification. Detach petrol pipe union at the float chamber end; turn on petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks.
Flooding may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machines is due to impurities (grit, fluff, etc.) in the tank, so clean out the float chamber periodically until the trouble ceases. If the trouble persists: the tank might be drained, swilled out, etc. Note that if a carburetter, either vertical or horizontal, is flooding with the engine stopped, the overflow from the main jet will not run into the engine, but out of the carburetter through a hole at the base of the mixing chamber.

FIXING CARBURETTER AND AIR LEAKS. Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe, check by means of an oil can and eliminate by new washers and the equal tightening up of the flange nuts. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

BANGING IN EXHAUST may be caused by too weak a pilot mixture when the throttle is closed, it may also be caused by too rich a pilot mixture and an air leak in the exhaust system, the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the banging happens when the throttle is fairly wide open, the trouble will be ignition not carburation.

BAD PETROL CONSUMPTION of a new machine may be due to flooding, caused by impurities from the petrol tank lodging on the float needle seat and so prevent its valve from closing. If the machine has had several years use, flooding may be caused by a worn float needle valve. Also bad petrol consumption will be apparent if the throttle needle jet "O" (see fig. 2) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be then the only remedy is to get a new needle jet.

AIR FILTERS. These may affect the jet setting, so if one is fitted afterwards to the carburetter the main jet may have to be smaller. If a carburetter is set with an air filter and the engine is to run without it, take care not to overheat the engine due to too weak a mixture; testing with the air valve (sheet 6-4) will indicate if a larger main jet and higher needle position are required.

FAULTS, read sheet 6. The trouble may not be carburation; if the trouble cannot be remedied by making the mixture richer or weaker with the air-valve, and you know the petrol feed is good and the carburetter is not flooding, the trouble is elsewhere.

RE-ASSEMBLING *after dismantling*. Note particularly that the mixing chamber nut E (fig. 2, sheet 2) is tightened up tight onto the washer that holds the jet block F (fig. 2 sheet 2), otherwise petrol will leak up. When replacing the throttle see that the throttle needle goes into the centre hole in the choke block and once in, note the throttle works freely when the mixing chamber top ring Z is screwed down firmly and held by spring Z1. Float chamber lid, to remove, first loosen screw X (FIG. 2). To remove float, pinch the bow V (fig. 2), and pull; when replacing, slip over needle and slide down till bow jumps into the needle groove. Care required to avoid bending needle.

HOW TO TRACE FAULTS

sheet 5

There are only TWO possible faults in carburation; either RICHNESS of mixture or WEAKNESS of mixture, so in case of trouble, decide which is the cause, by.

1. Examining the petrol feed. Verify jets and passages are clear
   Verify ample flow
   Verify there is no flooding.
2. Looking for air leaks. At the connection to the engine.
   Or due to leaky inlet valve stems.
3. Defective or worn parts. Slack throttle or worn needle jet.
   The mixing chamber union nut not tightened up, or loose jets
4. TEST WITH THE AIR VALVE, to see if by richening the mixture, the results are better or worse.

INDICATIONS OF:

RICHNESS.
Black smoke in exhaust.
Petrol spraying out of the carb.
Four strokes, eight stroking.
Heavy, lumpy running.
Heavy petrol consumption.
- *If the jet block F is not tightened up by washer and nut E, richness will be caused through leakage of petrol*
- *Air cleaner choked up.*
- *Needle jet worn large.*

Sparking plug sooty.

WEAKNESS
Spitting in carburetter.
Erratic slow running.
Overheating.
Acceleration poor.
Engine goes better if:
- throttle not wide open or air valve is partially closed
- *Has air cleaner been removed*
- *Jets partially choked up*

REMOVING the silencer or running with a racing silencer requires a richer setting and a larger main jet.

NOTE:
Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing DECIDE BY TEST WHETHER RICHNESS OR WEAKNESS IS THE TROUBLE AND AT WHAT THROTTLE POSITION. See throttle opening diagrams, sheet 7.

PROCEDURE:
If at a particular throttle opening you partially close the air valve and the engine goes better, weakness is indicated. If the running is worse, richness is indicated. THEN YOU PROCEED TO ADJUST THE APPROPRIATE PART AS INDICATED AT THE BOTTOM OF SHEET 7 FOR THAT THROTTLE POSITION.

FAULT AT THROTTLE POSITIONS (Indicated on sheet 7)

TO CURE RICHNESS
1, Fit smaller main jet.
2, Screw out pilot air screw.
3, Fit a throttle with larger cut-away.
4, Lower needle one or two grooves.

TO CURE WEAKNESS
1, Fit larger main jet.
2, Screw pilot air screw in.
3, Fit a throttle with smaller cut-away.
4, Raise needle one or two grooves.

NOTE: It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle, the correct way is to lower the needle.

CHANGING FROM STANDARD PETROLS TO SPECIAL FUELS, such as alcohol mixtures will, with the same setting in the carburetter, certainly cause weakness of mixture and possible damage from overheating.

PARTS TO TUNE UP WITH

sheet 6

(A), This fig. 4 is two diagrammatic sections of the carburetter to show:-
1. The throttle stop screw
2. The pilot screw

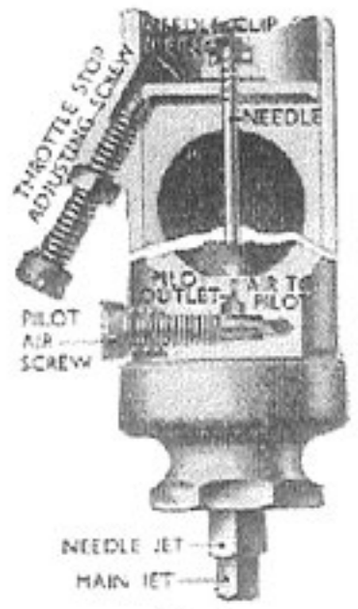


Fig. 4.

(b), **THROTTLE STOP SCREW.**
Set this screw to prop the throttle open sufficiently to keep the engine running when the twist grip is shut off.

(c), **PILOT AIR SCREW.**
This screw regulates the strength of the mixture for idling and for the initial opening of the throttle. The screw controls the suction on the pilot petrol jet by metering the amount of air that mixes with the petrol.

NOTE.- The air for the pilot jet may be admitted internally or externally according to one or other of the designs, but there is no difference in tuning.

(d), **MAIN JET.** The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. NEVER REAMER A JET OUT, GET ANOTHER OF THE RIGHT SIZE. The bigger the number the bigger the jet.
To get at the main jet, undo the float chamber holding bolt Q (sheet 2). The jet is screwed into the needle jet so if the jet is tight, hold the needle jet carefully with a spanner, whilst unscrewing the main jet.

(e), **NEEDLE AND NEEDLE JET.** The needle is attached to the throttle and being a taper, either allows more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The needle jet is of a defined size and is only altered from standard when using alcohol fuels.
The taper needle position in relation to the throttle opening, can be set according to the mixture required, by fixing it to the throttle with the needle clip spring in a certain groove (see above illustration), thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttles openings from quarter to three-quarters open (see illustration sheet 7).

(f), **THROTTLE VALVE CUTAWAY.** The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cutaway is recorded by a number marked on the throttle, eg. 6/3 means throttle type 6 with number 3 cutaway. Larger cutaways, say 4 and 5, give weaker mixtures, and 2 would give a richer mixture.

(g), **AIR VALVE,** is only used for starting and running when cold, and for experimenting with, otherwise run with it wide open.

(h), **TICKLER,** a small plunger spring loaded in the float chamber lid. When pressed down on the float the needle valve is pushed off its seat and so "flooding" is achieved. Flooding temporarily enriches the mixture until the level of the petrol subsides to normal.

HOW TO TUNE UP

sheet 7

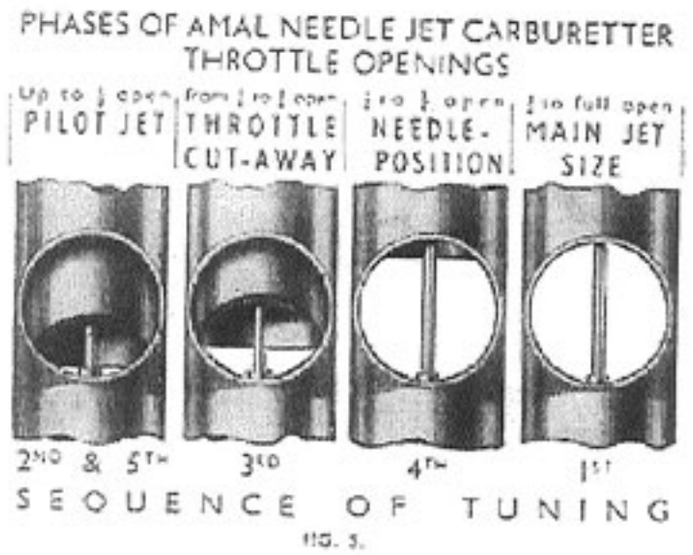


fig. 3.

TUNE UP IN THE FOLLOWING ORDER ONLY, by so doing you will not upset good results obtained.

READ REMARKS ON SHEET 5 AND 6 for each tuning device and get the motor going perfectly on a quiet road with a slight up gradient so that on test the engine is pulling.

1st. MAIN JET with throttle in position 1 (sheet 7) that full throttle the engine runs heavily, the main jet is too large. If at full throttle by slightly closing the throttle or air valve, the engine seems to have better power, the main jet is too small. With a correct sized main jet, the engine at full throttle should run evenly and regularly with maximum power. If you are testing for speed work, ensure that the main jet size is sufficient for the mixture to be rich enough to keep the engine cool, and to verify this, examine the sparking plug after taking a fast run, de-clutching and stopping the engine quickly. If the plug body at its end has a cool appearance, the mixture is correct, if sooty the mixture is rich, if however there are signs of intense heat, the mixture is too weak, and a larger main jet is required.

2nd. PILOT JET WITH THROTTLE IN POSITIONS 2 AND 5.
With the engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle stop screw, and ignition set for best slow running; a) loosen the stop screw nut and screw down until engine runs slower and begins to falter. Then screw the pilot air screw in or out to make the engine run regularly and faster. b) Now gently lower the throttle stop screw until the engine runs slower and just begins to falter, then lock the nut lightly and begin again to adjust the pilot air screw to get the best slow running. If this second adjustment makes the engine run too fast, go over the job again a third time. Finally, lock up tight the throttle stop screw nut without disturbing the screws position.

3rd. THROTTLE CUT AWAY with throttle in position 3 (sheet 7). If, as you take off from the idling position, there is objectional spitting from the carburetter, slightly richen the mixture by screwing in the air screw sufficiently, but if this is not effective, screw it back again, and fit a throttle with a smaller cut away. If the engine jerks under load at this throttle position and there is no spitting, either the throttle needle is too high or a larger throttle cut away is required to cure the richness.

4th. NEEDLE with throttle in position 4 (sheet 7). The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, eg: with the clip in a groove as near the top as possible. If acceleration is poor and with the air valve partially closed the results are better, raise the needle by two grooves. If much better, try lowering the needle by one groove and leave it where it is best. *NOTE, if the mixture is still too rich with the clip in groove number one (nearest the top), the needle and needle jet probably needs replacing due to wear.*

5th FINALLY go over the idling again for final touches.

TUNING TWIN ENGINES WITH TWIN CARBURETTERS

(where each cylinder has it's own carburetter)

sheet 8

To start with, slacken the throttle stop screws and put the twist grip into the shut off position, to allow the throttle to shut off. There should be a slight back-lash in the cables where back-lash can be obtained, if necessary, by screwing in the cable adjusting screws on the top of the carburetter.

Then, with the handlebars in the normal position, and with the throttles closed, adjust the cable adjusting screws so that on the slightest opening of the twist grip, both throttles begin to open simultaneously.

To set the carburetters, follow the procedure as given on sheet 7 overleaf, and bear in mind these "hints" which may be useful. Main jet sizes are selected by checking the effect of the mixture on the sparking plugs, after taking a run at full throttle over a straight piece of road. The smallest pair of jets that give the best maximum speed is usually correct provided that the plugs do not show any signs of excessive heat. It might be that for really critical tuning, one carburetter might require a slightly different jet size from the other.

For slow running, set the twist grip to make the engine run slowly but just faster than a "tick over". Then gently screw in the throttle stops to just hold the throttles in that position, and return the twist grip into the shut position, leaving the engine running on the throttle stops.

The next thing to do is to set each carburetter according to paragraph 2, on sheet 7, to obtain the idling by screwing down the throttle stop screws and adjusting the pilot air screws accordingly.

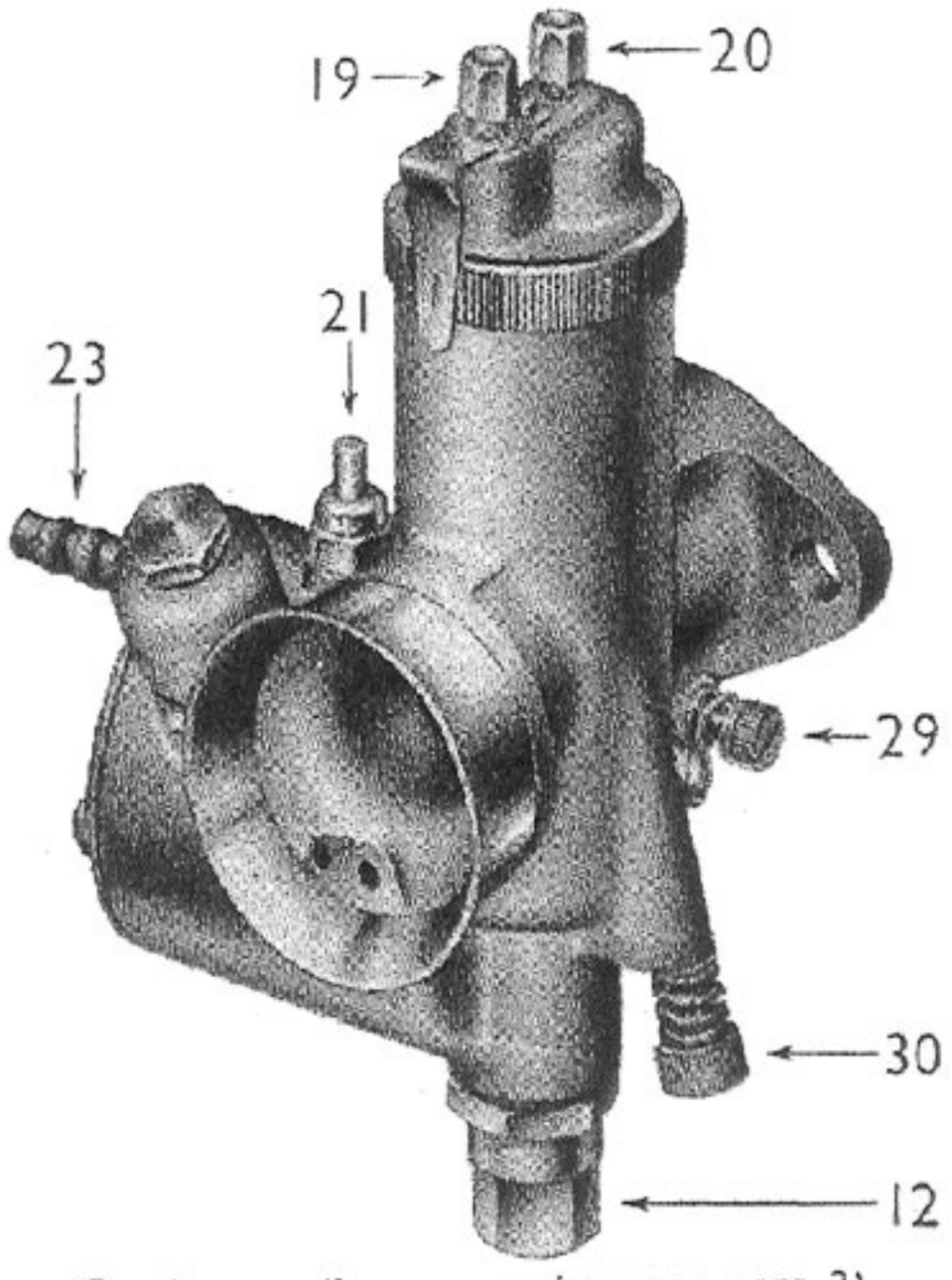
Regarding the setting of the pilot jets, a fairly satisfactory method is to detach one sparking plug lead, and set the pilot air adjusting screw on the other cylinder as a single unit, and then reversing the process to the other cylinder. It may be found that when both leads are connected to the sparking plugs, the engine runs slightly quicker than desirable. If this happens, a slight readjustment of the throttle stop screws will put this right. It is essential that the speed of idling on both cylinders is approximately the same, as this will either make or mar the smoothness of the get-away on the initial opening of the throttle. It is essential with twin carburetters that the throttle slides are a good fit in the bodies, and also that there is no suspicion of air leaks at either of the flange attachments to the cylinder.

With regards to the lower end of the throttle range, which is always the more difficult to set, one can only take excessive pains to make quite sure that the control cables are perfectly adjusted, without any excessive back-lash or difference in the amount of back-lash between one carburetter and another, otherwise one throttle slide will be out of phase with the other, and so resulting in uneven running.

To check the opening of the throttles simultaneously, shut the twist grip back so that the throttles are resting on the throttle stop screws in their final position of adjustment. Then, insert the fingers into the air intakes and press them on the throttles. With the other hand, gently open with the twist grip and feel the throttles lift off their stops at the same time.

HINTS AND TIPS

FOR AMAL MONOBLOC CARBURETTER
TYPES 375, 376, 389 and 689



(For key to diagram numbers see page 3)

SECTIONAL ILLUSTRATIONS OF CARBURETTERS.
TYPES 375, 376, 389 and 689

(For key to diagram numbers see page 3)

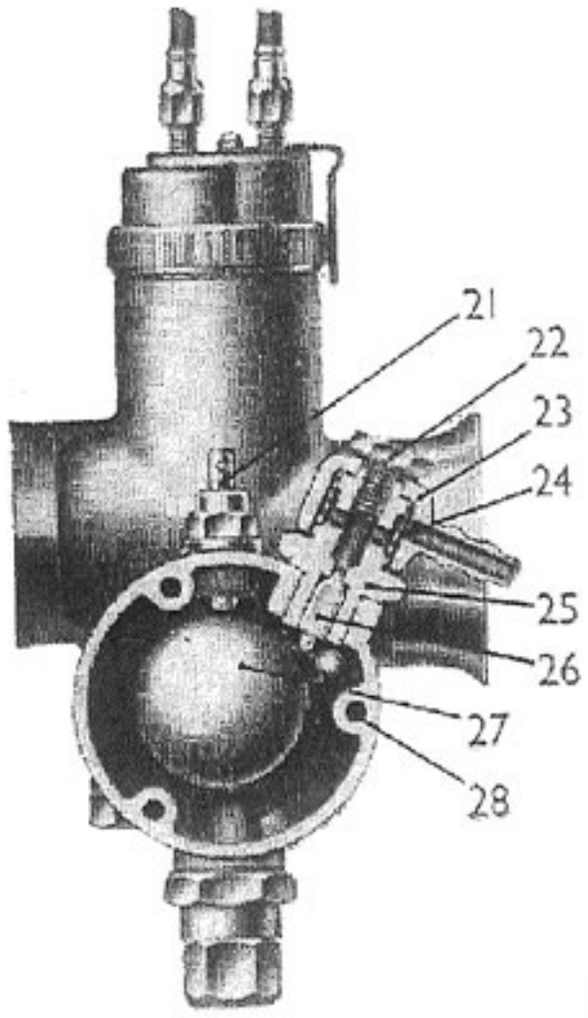


Fig. 1 - Section through float chamber

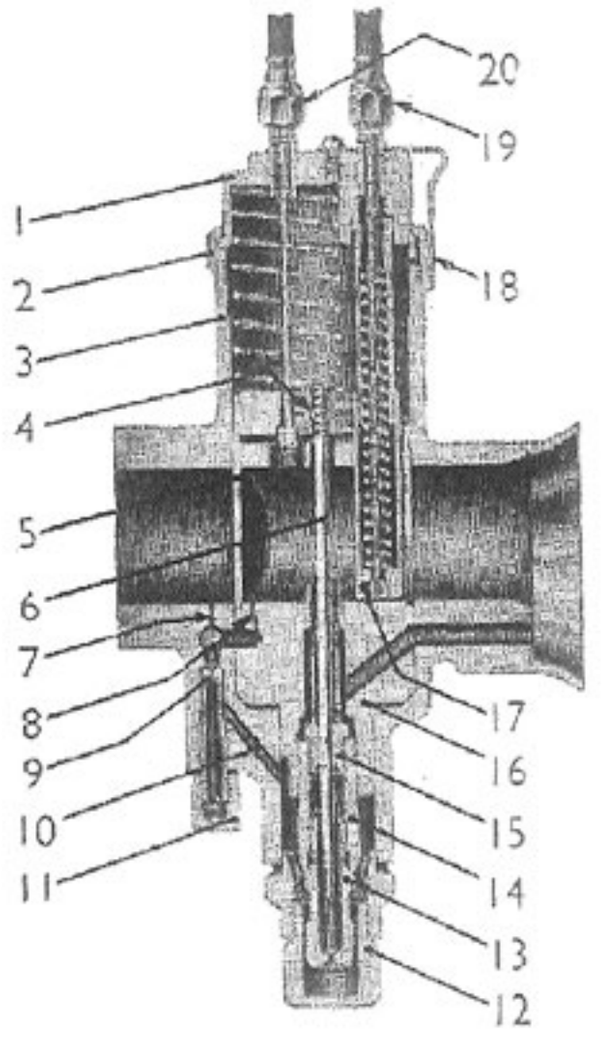


Fig. 2 - Section through mixing chamber, showing air valve and throttle closed

HOW IT WORKS AND PART NAMES

1. Mixing Chamber
2. Mixing Chamber cap
3. Carburetter Body
4. Jet Needle Clip
5. Throttle Valve
6. Jet Needle
7. Pilot Outlet
8. Pilot by-pass
9. Pilot Jet
10. Petrol feed to pilot jet
11. Pilot Jet Cover Nut
12. Main Jet cover
13. Main Jet
14. Jet Holder
15. Needle Jet
16. Jet Block
17. Air Valve
18. Mixing Chamber Cap Spring
19. Cable Adjuster (Air)
20. Cable Adjuster (Throttle)
21. Tickler
22. Banjo Bolt
23. Banjo
24. Filter Gauze
25. Needle Seating
26. Needle
27. Float
28. Side Cover screws
29. Pilot Air Adjusting Screw
30. Throttle Adjusting Screw
31. Air To Pilot Jet
32. Feed Holes in Pilot Jet
33. Bleed Holes in Needle Jet
34. Primary Air Choke
35. Primary Air Passage
36. Throttle valve Cutaway

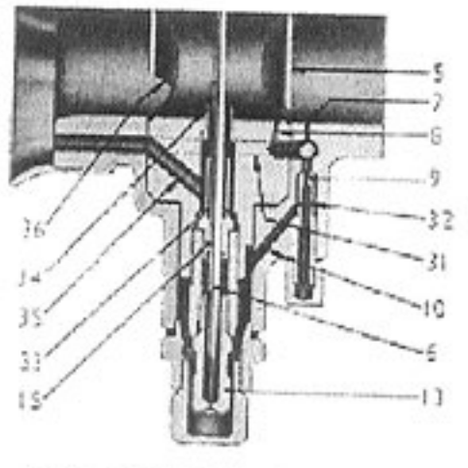
The carburetter proportions and atomises the right amount of petrol with the air that is drawn in by the engine because of the correct proportions of jet sizes and the main choke bore. The float chamber maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.

The throttle control from the handlebar controls the volume of mixture and therefore the power, and at all positions of the throttle the mixture is automatically correct. The opening of the throttle brings first into action the mixture supply from the pilot jet system for idling, then as it progressively opens, via the pilot by-pass, the mixture is augmented from the main jet, the earlier stages of which action is controlled by the needle in the needle jet. The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol-air mixture through the primary air choke into the main air choke. The primary air choke has a compensating action in conjunction with bleed holes in the needle jet, which serves the double purpose of air compensating the mixture from the needle jet and allowing the fuel to provide a well outside and around the needle jet, which is available for snap acceleration.

The carburetters usually have a separately-operated mixture control called an air valve, for use when starting from cold, and until the engine is warm; this control partially blocks the passage of air through the main choke.

Fig 3

Diagrammatic section of carburetter showing only the lower half of the throttle chamber with the throttle a little open and the internal primary air passages to the main jet and pilot system



FOR KEY TO DIAGRAM NUMBERS SEE ABOVE

HINTS AND TIPS

STARTING *from cold*. Flood the carburetter by depressing the tickler, and close the air valve. Then open the throttle a little, eg: about one eighth open, see diagram on sheet 7 position 2, then kick-start If it is too much open starting will be difficult. When engine starts open air valve and close the throttle; if the engine begins to falter, partially close the air valve until the engine is warm, then set in the fully open position.

STARTING, *engine hot*. Do not flood the carburetter, Then open the throttle about one eighth of its travel and kick-start. If the carburetter has been flooded and won't start because the mixture is too rich - open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle one eighth open, and air lever wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

STARTING, *general*. By experiment, find out if and when it is necessary to flood, also note the best position for the air lever and the throttle for the easiest starting.

CABLE CONTROLS See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjusters on the top of the carburetter. See that the throttle shuts down freely.

PETROL FEED, verification. Later models are fitted with a filter gauze at the inlet to the float chamber To remove the filter gauze, unscrew the banjo bolt (22), the banjo can then be removed and the filter gauze removed from the needle seating. Ensure that the filter gauze is not damaged and free from dirt. Before replacing the banjo, turn on the petrol tap momentarily ands ee that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks. *Flooding* may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machine is due to impurities (grit, fluff, etc.) in the tank, so clean out the float chamber periodically until the trouble ceases. If the trouble persists, the tank might be drained, swilled out, etc.

FIXING CARBURETTER AND AIR LEAKS. Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe, check by means of an oil can and eliminate by new washers and the equal tightening up of the flange nuts. Most models have an "O" ring provision machined into the flange, make sure that this is undamaged and replace if necessary. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

BANGING IN EXHAUST may be caused by too weak a pilot mixture when the throttle is closed. It may also be caused by too rich a pilot mixture and an air leak in the exhaust system, the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the banging happens when the throttle is fairly wide open, the trouble will be ignition not carburation.

BAD PETROL CONSUMPTION of a new machine may be due to flooding, caused by impurities from the petrol tank lodging on the float needle seat and so prevent its valve from closing. If the machine has had several years use, flooding may be caused by a worn float needle valve. Also bad petrol consumption will be apparent if the throttle needle jet "15" (see fig. 2) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be then the only remedy is to get a new needle jet.

AIR FILTERS. These may affect the jets etting, so if one is fitted afterwards to the carburetter the main jet may have to be smaller. If a carburetter is set with an air filter and the engine is to run without it, take care not to overheat the engine due to too weak a mixture; testing with the air valve (sheet 6) will indicate if a larger main jet and higher needle position are required.

EFFECT OF ALTITUDE ON CARBURETTER. Increased altitude tends to produce a rich mixture. The greater the altitude, the smaller the main jet required. Carburetters ex-works are suitable for altitudes upto 3,000 feet approximately. Carburetters used constantly at altitudes 3,000 to 6,000 feet should have a reduction in the main jet size of 5%, and thereafter for every 3,000 feet in excess of 6,000 feet altitude, further reductions of 4% should be made.

RE-ASSEMBLING

RE-ASSEMBLING after dismantling. See that the washer on the bottom of the jet block is in good condition, otherwise fuel will leak across its face causing rich erratic running, if the washer is faulty it should be replaced by a new one. When replacing the throttle see that the jet needle goes into the centre hole in the jet block and once in, check the throttle works freely when the mixing chamber cap (2) is screwed down firmly by spring clip (18).

When re-assembling the float see that the narrow leg portion of its hinge is uppermost as this operates the float needle. Care should be taken to see that the joint faces of the side cover and body are not damaged or warped and that the joint washer is in good condition, otherwise difficulty will be experienced in making a petrol tight joint.

HOW TO TRACE FAULTS

There are only TWO possible faults in carburation, either RICHNESS of mixture or WEAKNESS of mixture, so in case of trouble, decide which is the cause, by:

1. Examining the petrol feed. — Verify jets and passages are clear.
   Verify the banjo gauze is clear and allows ample flow.
   Verify there is no flooding.
2. Looking for air leaks — At the connection to the engine.
   Or due to leaky inlet valve stems.
3. Defective or worn parts — Slack throttle or worn needle jet
   Loose jets.
4. Test with the air valve, to see if by richening the mixture, the results are better or worse.

INDICATIONS OF:

RICHNESS
Black smoke in exhaust.
Petrol spraying out of the carb.
Four strokes, eight stroking.
Heavy, lumpy running.
Heavy petrol consumption.
- *If the jet block 16 is not tightened up by washer and nut 14, richness will be caused through leakage of petrol.*
- *Air cleaner choked up.*
- *Needle jet worn large.*

Sparking plug sooty.

WEAKNESS
Spitting in carburettor.
Erratic slow running.
Overheating.
Acceleration poor.
Engine goes better if:
- throttle not wide open
  or air valve is partially closed.
- *Has air cleaner been removed.*
- *Jets partially choked up.*

REMOVING the silencer or running with a racing silencer requires a richer setting and a larger main jet.

NOTE:
Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing. Now at throttle position shown on sheet 7, fig 5, test to see if the mixture is rich or weak. This is done by partially closing the air valve, and if the engine runs better weakness is indicated, but if the engine runs worse richness is indicated.

TO CURE RICHNESS
1. Fit smaller main jet.
2. Screw out pilot air screw.
3. Fit a throttle with larger cut-away.
4. Lower needle one or two grooves.

TO CURE WEAKNESS
1. Fit larger main jet.
2. Screw pilot air screw in.
3. Fit a throttle with smaller cut-away.
4. Raise needle one or two grooves.

NOTE: It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle, the correct way is to lower the needle.

CHANGING FROM STANDARD PETROLS TO SPECIAL FUELS, such as alcohol mixtures will, with the same setting in the carburettor, certainly cause weakness of mixture and possible damage from overheating.

PARTS TO TUNE UP WITH

(a). This fig. 4 is two diagrammatic sections of the carburetter to show:-
1. The throttle adjusting screw
2. The pilot air adjusting screw

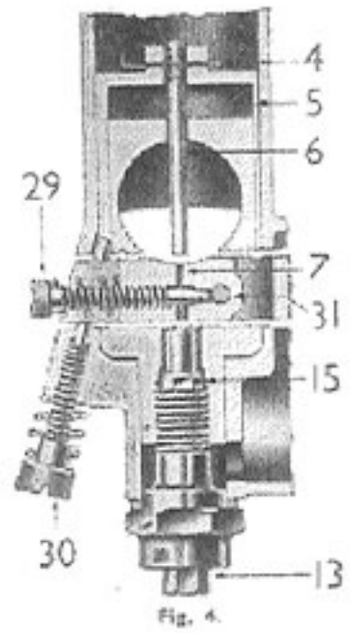


Fig. 4.

(b), **THROTTLE ADJUSTING SCREW.**
Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is shut off.

(c), **PILOT AIR ADJUSTING SCREW.**
This screw regulates the strength of the mixture for idling and for the initial opening of the throttle. The screw controls the depression on the pilot petrol jet by metering the amount of air that mixes with the petrol.

(d), **MAIN JET.** The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. NEVER REAMER A JET OUT, GET ANOTHER OF THE RIGHT SIZE. The bigger the number the bigger the jet. To remove the main jet unscrew the main jet cover, the exposed main jet can then be unscrewed from the jet holder.

(e), **NEEDLE AND NEEDLE JET.** The needle is attached to the throttle and being a taper, either allows more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The taper needle position in relation to the throttle opening, can be set according to the mixture required, by fixing it to the throttle with the needle clip in a certain groove (see above illustration). Thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttles openings from quarter to three-quarters open (see illustration sheet 7). The needles are marked with the letters: B type are fitted in the 375 carburetter
C type are fitted in the 376 carburetter
D type are fitted in the 389 carburetter

(f), **THROTTLE VALVE CUTAWAY.** The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cutaway is recorded by a number marked on the throttle, eg: 376/3 means throttle type 376 with number 3 cutaway; Larger cutaways, say 4 and 5, give weaker mixtures, and 2 would give a richer mixture.

(g), **AIR VALVE,** is only used for starting and running when cold, and for experimenting with, otherwise run with it wide open.

(h), **TICKLER,** a small plunger spring loaded in the float chamber wall. When pressed down on the float the needle valve is pushed off its seat and so "flooding" is achieved. Flooding temporarily enrichens the mixture until the level of the petrol subsides to normal.

HOW TO TUNE UP

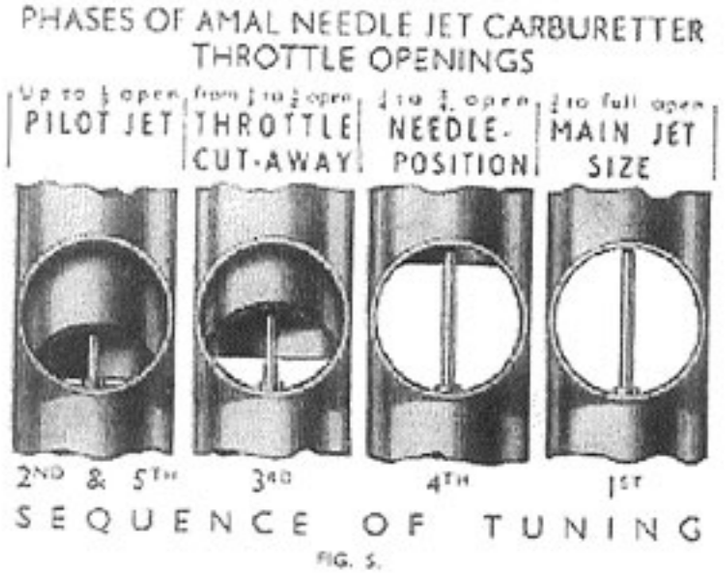


FIG. 5.

TUNE UP IN THE FOLLOWING ORDER ONLY, by so doing you will not upset good results obtained

READ REMARKS ON SHEET 5 AND 6 for each tuning device and get the motor going perfectly on a quiet road with a slight up gradient so that on test the engine is pulling.

1st. MAIN JET with throttle in position 1 (sheet 7). If at full throttle the engine runs 'heavily', the main jet is too large. If at full throttle by slightly closing the throttle or air valve, the engine seems to have better power, the main jet is too small. With a correct sized main jet, the engine at full throttle should run evenly and regularly with maximum power. If you are testing for speed work, ensure that the main jet size is sufficient for the mixture to be rich enough to keep the engine cool, and to verify this, examine the sparking plug after taking a fast run, de-clutching and stopping the engine quickly. If the plug body at its end has a cool appearance, the mixture is correct. If sooty the mixture is rich. If however there are signs of intense heat, the mixture is too weak, and a larger main jet is required.

2nd. PILOT JET WITH THROTTLE IN POSITIONS 2 AND 5.
With the engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle adjusting screw, and ignition set for best slow running; a) screw out the throttle adjusting screw until the engine runs slower and begins to falter. Then screw the pilot air adjusting screw in or out to make the engine run regularly and faster. b) Now gently lower the throttle adjusting screw until the engine runs slower and just begins to falter, and begin again to adjust the pilot air adjusting screw to get the best slow running. If this second adjustment makes the engine run too fast, go over the job again a third time.

3rd. THROTTLE CUT AWAY with throttle in position 3 (sheet 7). If, as you take off from the idling position, there is objectional spitting from the carburetter, slightly richen the mixture by screwing in the air screw sufficiently, but if this is not effective, screw it back again, and fit a throttle with a smaller cut away. If the engine jerks under load at this throttle position and there is no spitting, either the throttle needle is too high or a larger throttle cut away is required to cure the richness.

4th. NEEDLE with throttle in position 4 (sheet 7). The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, eg: with the clip in a groove as near the top as possible. If acceleration is poor and with the air valve partially closed the results are better, raise the needle by two grooves. If much better, try lowering the needle by one groove and leave it where it is best. *NOTE, if the mixture is still too rich with the clip in groove number one (nearest the top), the needle and needle jet probably needs replacing due to wear.*

5th FINALLY go over the idling again for final touches.

TUNING TWIN ENGINES WITH TWIN CARBURETTERS

(where each cylinder has it's own carburetter)

To start with, slacken the throttle stop screws and put the twist grip into the shut off position, to allow the throttle to shut off. There should be a slight back-lash in the cables where back-lash can be obtained, if necessary, by screwing in the cable adjusting screws on the top of the carburetter.

Then, with the handlebars in the normal position, and with the throttles closed, adjust the cable adjusting screws so that on the slightest opening of the twist grip, both throttles begin to open simultaneously.

To set the carburetters, follow the procedure as given on sheet 7 overleaf, and bear in mind these "hints" which may be useful. Main jet sizes are selected by checking the effect of the mixture on the sparking plugs, after taking a run at full throttle over a straight piece of road. The smallest pair of jets that give the best maximum speed is usually correct provided that the plugs do not show any signs of excessive heat. It might be that for really critical tuning, one carburetter might require a slightly different jet size from the other.

For slow running, set the twist grip to make the engine run slowly but just faster than a "tick over". Then gently screw in the throttle stops to just hold the throttles in that position, and return the twist grip into the shut position, leaving the engine running on the throttle stops.

The next thing to do is to set each carburetter according to paragraph 2, on sheet 7, to obtain the idling by screwing down the throttle stop screws and adjusting the pilot air screws accordingly.

Regarding the setting of the pilot jets, a fairly satisfactory method is to detach one sparking plug lead, and set the pilot air adjusting screw on the other cylinder as a single unit, and then reversing the process to the other cylinder. It may be found that when both leads are connected to the sparking plugs, the engine runs slightly quicker than desirable. If this happens, a slight readjustment of the throttle stop screws will put this right. It is essential that the speed of idling on both cylinders is approximately the same, as this will either make or mar the smoothness of the get-away on the initial opening of the throttle.
It is essential with twin carburetters that the throttle slides are a good fit in the bodies, and also that there is no suspicion of air leaks at either of the flange attachments to the cylinder.

With regards to the lower end of the throttle range, which is always the more difficult to set, one can only take excessive pains to make quite sure that the control cables are perfectly adjusted, without any excessive back-lash or difference in the amount of back-lash between one carburetter and another, otherwise one throttle slide will be out of phase with the other, and so resulting in uneven running.

To check the opening of the throttles simultaneously, shut the twist grip back so that the throttles are resting on the throttle stop screws in their final position of adjustment. Then, insert the fingers into the air intakes and press them on the throttles. With the other hand, gently open with the twist grip and feel the throttles lift off their stops at the same time.

SECTION G1a

Lucas Coil Ignition Equipment

Used on "Meteor 700 " and " 500 Twin" up to end of 1954

1. General

The coil ignition equipment comprises an ignition coil, a contact breaker with automatic advance and a high tension distributor.

1 (a). Ignition Coil

The ignition coil consists of a laminated core, around which are wound the primary (or low tension) and the secondary (or high tension) windings. The secondary winding consists of a large number of turns of fine wire and the primary winding of relatively few turns of thicker wire. The primary winding is wound outside the secondary, in order to allow the heat produced to be dissipated more easily.

The coil assembly is mounted on a porcelain insulator within a sealed metal case filled with an insulation compound or oil to prevent the ingress of moisture.

The only maintenance possible is to keep the coil casing clean and free from oil and water, paying especial attention to the moulding at the terminal end and to check the terminal connections for tightness from time to time.

To fit a new H.T. cable to the coil, remove the knurled moulded nut and thread it over the end of the cable. Bare the cable for a length of about ½ in., thread the wire through the brass washer provided and bend back the strands (see Fig. 1). Finally, screw the nut into its terminal.

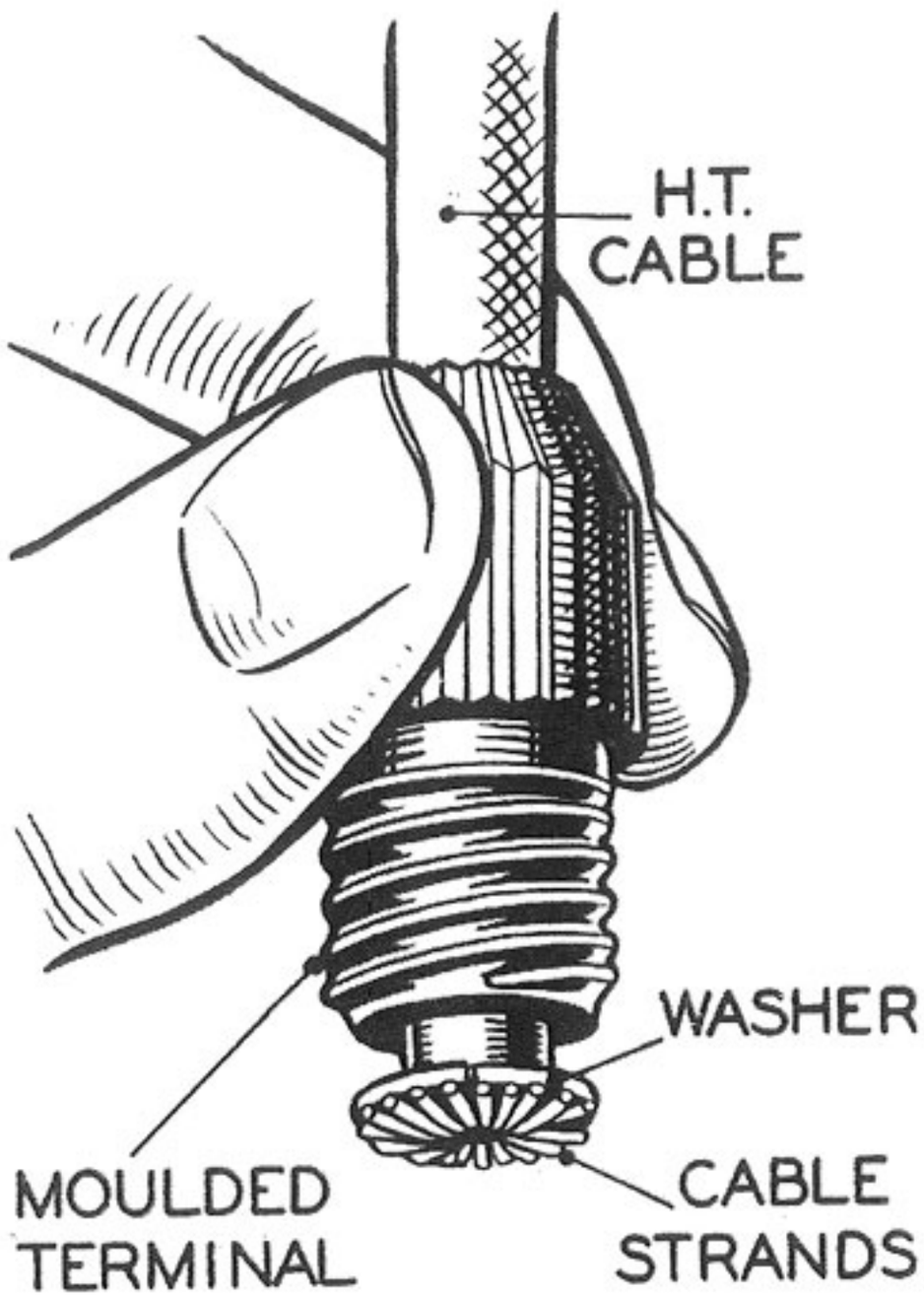


Fig. 1

1 (b). Distributor

Fig. 2 illustrates the distributor model DKX. It has a moulded contact breaker base and the shaft is carried in two porous bronze bushes.* A high-tension distributor rotor is fitted on an extension of the cam spindle, the moulded distributor cover carrying two electrodes and a carbon brush which are connected to the plug leads and the H.T. lead from the ignition coil respectively.

2. Routine Maintenance

2 (a). Distributor

(i) Lubrication. To be carried out every 3,000 miles.

Cam. Smear the surface of the cam very lightly with Mobilgrease No. 2 or, if this is not available, clean engine oil may be used.

Cam Bearing. Remove the rotor arm and apply a few drops of thin machine oil to the hollow screw thus exposed. On early models the screw may not be drilled, in which case it should be removed and oil applied to the tapped hole.

Contact breaker pivot. Place a small amount of Mobilgrease No. 2 or clean engine oil on the pivot on which the contact breaker lever turns.

Shaft. When a lubricator is fitted in the shank of the unit add a few drops of thin machine oil. On later models there is a single long bush of

***Later models have a single sintered iron bush.**

sintered iron which will absorb sufficient oil from the oil feed to the helical driving pinion.

Automatic timing control. Unscrew the two screws securing the contact breaker base plate to the distributor body and lubricate the timing control mechanism with thin machine oil, paying particular attention to the pivots. Refit the base plate.

No grease or oil must be allowed to get on or near the contacts when carrying out the foregoing procedure.

(ii) Cleaning. To be carried out every 6,000 miles. Wipe the inside and the outside of the cover moulding with a soft dry cloth. Pay 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 them with a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this, unscrew the nut securing the end of the contact breaker spring and remove the nut, spring washer and bush. Lift the contact breaker lever off its bearing. After cleaning check the contact breaker gap setting.

(iii) Contact breaker setting. Contact breaker gaps should be checked every 3,000 miles. If the gap is allowed to decrease below the specified setting, rapid and excessive pitting and piling may occur.

Turn the engine until the contacts are seen to be fully opened and check the gap with a gauge having a thickness of .014 - .016 in. If the gap is correct the gauge should be a sliding fit but if the gap varies from the gauge, the setting must be adjusted.

To do this, keep 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 set to the thickness of the gauge and tighten the two locking screws.

2 (b). High Tension Cables

Examine the high tension cables. Any, which have the insulation cracked or perished, or show signs of damage in any other way, must be renewed, using neoprene covered rubber ignition cable.

3. Servicing

3(a). Testing in Position to Locate Ignition Fault

If a failure of ignition or misfiring occurs, first make sure that the trouble is not due to defects in the engine, carburetter, petrol supply, sparking plug(s), etc. If necessary adjust the sparking plug gaps to .018 - .020 in. This must be done by bending the earth points only, **not the central electrode.** Ensure also that the battery is not discharged.

(i) Examine the high tension cables. If the rubber shows signs of deterioration or cracking the cable should be renewed using neoprene covered high tension cable.

(ii) Test each plug and high tension cable by removing the plug and allowing it to rest on the cylinder head and observing whether a spark occurs at the points when the engine is turned. It should, however, be noted that this is only a rough test, since it is possible that sparking may not take place when the plug is under compression.

(iii) Examine the contact breaker, checking the gap setting and measuring the contact breaker spring tension. This should be 20-24 oz. measured at the contacts.

(iv) Switch on the ignition, turn the engine and observe the ammeter reading. If an ammeter reading is given which rises and falls with the closing and opening of the contacts the low tension wiring is in order. If the reading does not fluctuate in this way a short circuit in the low tension wiring is indicated.

Check the capacitor (condenser) and ignition coil for short circuit by substitution. Examine the insulation of the contact breaker.

When no reading is given a broken or loose connection in the low tension wiring is indicated. Refer to the wiring diagram and examine the connections to the ignition switch. Check the ignition coil by substitution.

Remove the high tension cable from the centre distributor terminal. Switch on the ignition and turn the engine until the contacts close. Flick the contact breaker lever open while the high tension lead from the coil is held about 3/16 in. away from the cylinder block. If the ignition equipment is in order a strong spark should be obtained. If no spark is given it indicates a fault in the circuit of the secondary winding of the coil and the coil should be replaced.

3 (b). Dismantling the Distributor

Spring back the securing clips and remove the moulded cover (see Fig. 2). Lift the moulded rotor arm off the top of the spindle. Withdraw the two securing screws and lift off the contact breaker base.

Unscrew the nut on the moving contact pillar and remove the spring washer and bush. Lift off the contact breaker spring and contact breaker arm. The fixed contact is secured on a plate by

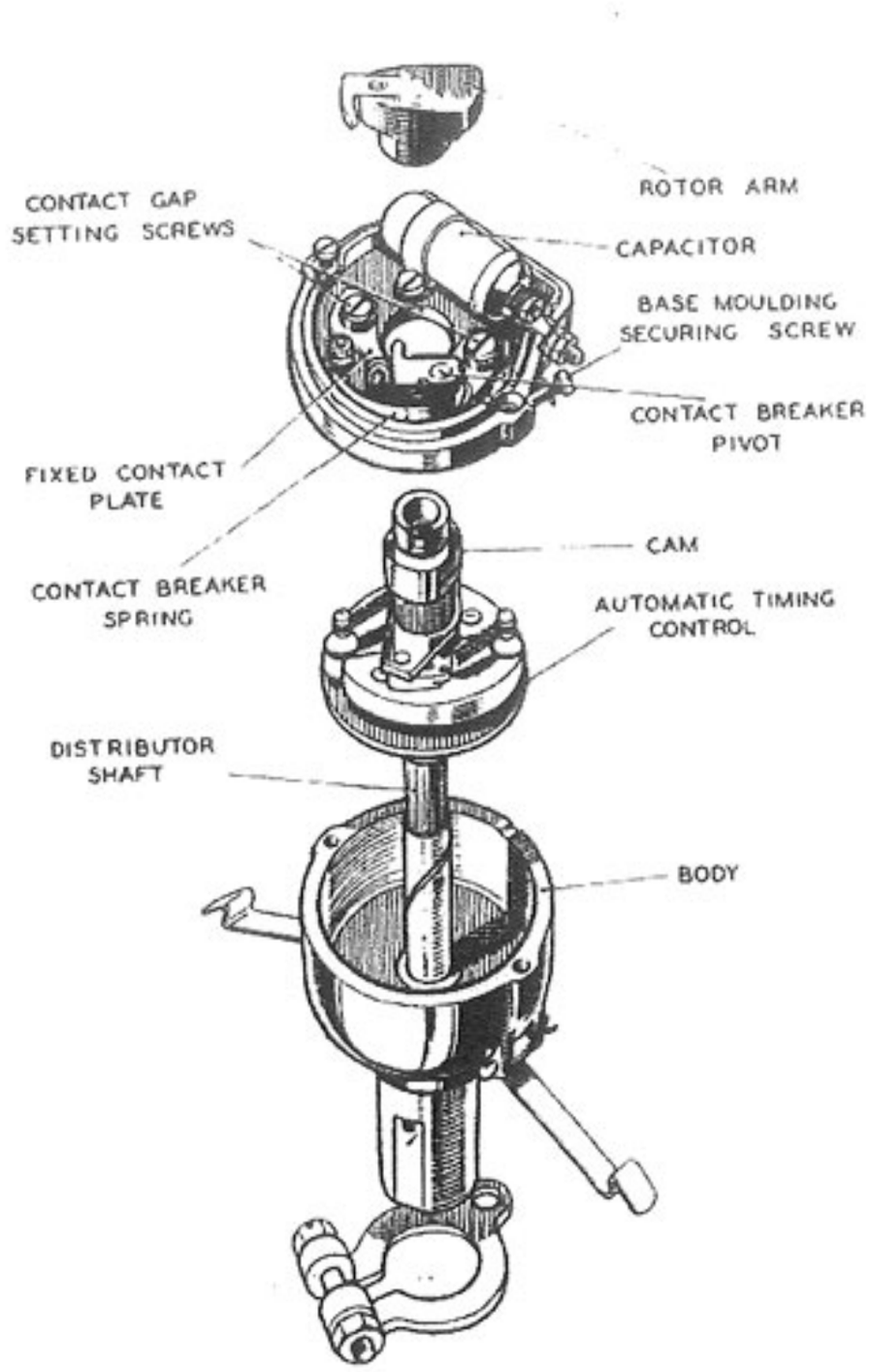


Fig. 2

two screws. Withdraw the two screws and lift off the fixed contact.

Remove the single securing screw and terminal nut on the condenser and lift off the condenser.

Withdraw the driving dogs on the shaft carrying the cam and automatic timing control and lift these off the shaft.

The automatic timing control should not be dismantled unnecessarily. If it is desired to dismantle the mechanism, carefully note the position of the various components in order that they may be refitted correctly.

3 (c). Bearings

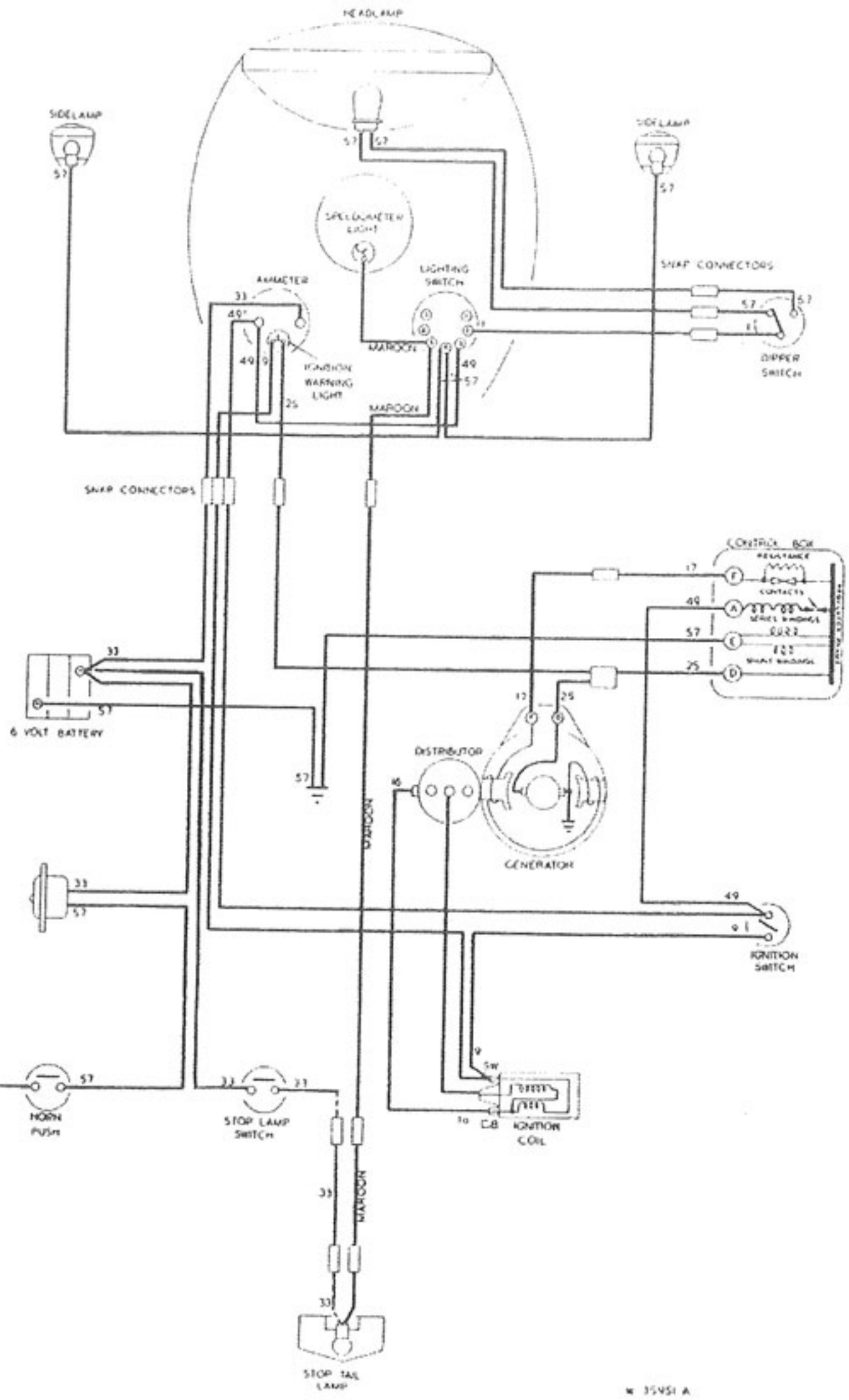
Badly worn bearings are usually indicated by the maximum opening of the contacts varying considerably as the shaft is slowly rotated by hand while side pressure is applied to the cam. Porous bronze bearing bushes should be inserted in the body on a highly polished shouldered mandrel, which will give the finished bore diameter without machining. Before use, bushes should be stored in a covered container and fully covered with oil of a grade equivalent to Mobiloil Arctic or other good thin mineral oil for a minimum time of 24 hours.

3 (d). Contact Breaker

When trimming a pair of contacts it is not essential to grind down a slightly pitted contact but only to remove excess metal from the piled contact. Should the pitting and piling be found excessive a replacement contact set, comprising both fixed and moving contacts, should be fitted. Before despatch, replacement contacts are given a protective coating of oil, which should be removed with a petrol-moistened cloth before fitting.

3 (e). Reassembly

Reassembly is a reversal of the dismantling procedure described in Subsection 3 (b). Note that an insulating washer must be placed over the contact breaker pivot before the moving contact is fitted.



KEY TO CABLE COLOURS

1 BLUE
2 BLUE with RED
3 BLUE with YELLOW
4 BLUE with WHITE
5 BLUE with GREEN
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8 BLUE with BLACK
9 WHITE
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56 PURPLE with BLACK
57 BLACK
58 BLACK with RED
59 BLACK with YELLOW
60 BLACK with BLUE
61 BLACK with WHITE
62 BLACK with GREEN
63 BLACK with PURPLE
64 BLACK with BROWN
65 DARK GREEN
66 LIGHT GREEN

WIRING DIAGRAM
Fig. 3

SECTION G1b

Lucas Magdyno

Model MN2L for Twin Cylinder Engines used on "500 Twin" and "Meteor 700" 1955 Models

1. General

The magdyno is a base-fixed magneto and dynamo unit, the body of the magneto portion being arranged to carry a standard strap-fixed dynamo. A shock absorbing drive is arranged between the magneto and dynamo portions. The magneto portion has a wound rotating armature and a high-energy magnet case integral with the body.

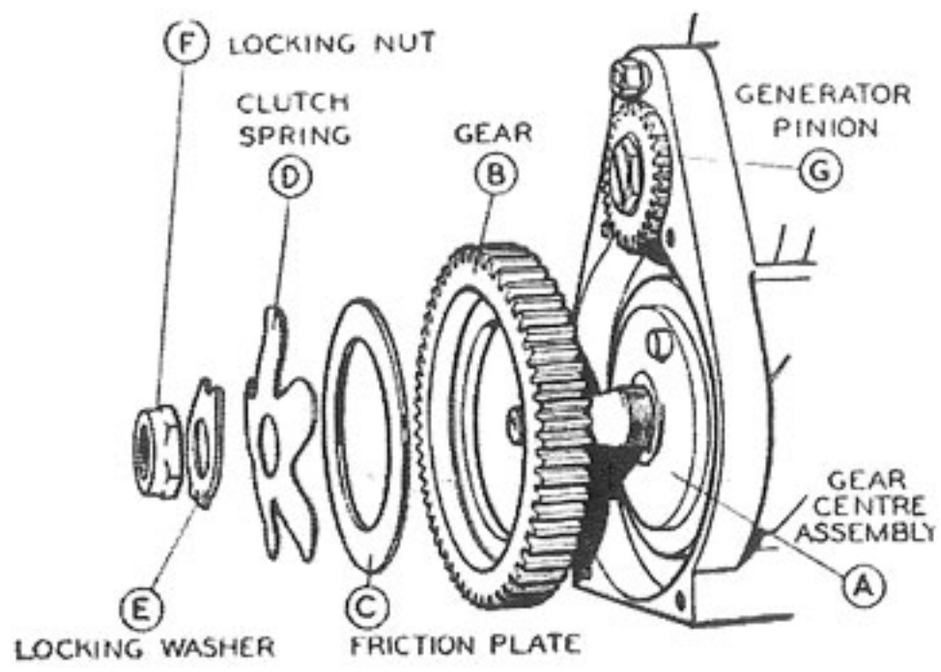


Fig. 1

The shock absorbing drive is incorporated in the larger of the two gears which transmit the drive from the magneto shaft to the dynamo and is shown exploded in Fig. 1. This drive, whilst permitting maximum dynamo output to be obtained, reduces peak shock loadings on the teeth of a bakelised fabric gear to a minimum value. The drive is taken from metal gear centre A, keyed to the magneto shaft, to fabric gear B by means of friction plate C and clutch spring D. A peg projecting from gear centre A prevents relative movement of the gear centre and tension spring D. In the event of a back-fire or an electrical shortcircuit, slip will occur between the contacting surfaces of fabric gear B and gear centre A.

2. Routine Maintenance

2 (a). Lubrication

To be carried out every 3,000 miles.

Wipe the outside of the Magdyno to remove dirt or grease, then take off the contact breaker cover (see Fig. 2). Unscrew the hexagon headed screw in the centre of the contact breaker and withdraw the contact breaker from its housing. Push aside the contact breaker arm retaining spring and prise the arm off its pivot. Wipe away any dirt or grease from the contacts with a petrol-moistened cloth.

If necessary, use a very fine carborundum stone to polish the contacts, re-cleaning afterwards with a petrol-moistened cloth. Smear the pivot pin with a little Mobilgrease No. 2 before refitting the contact breaker arm.

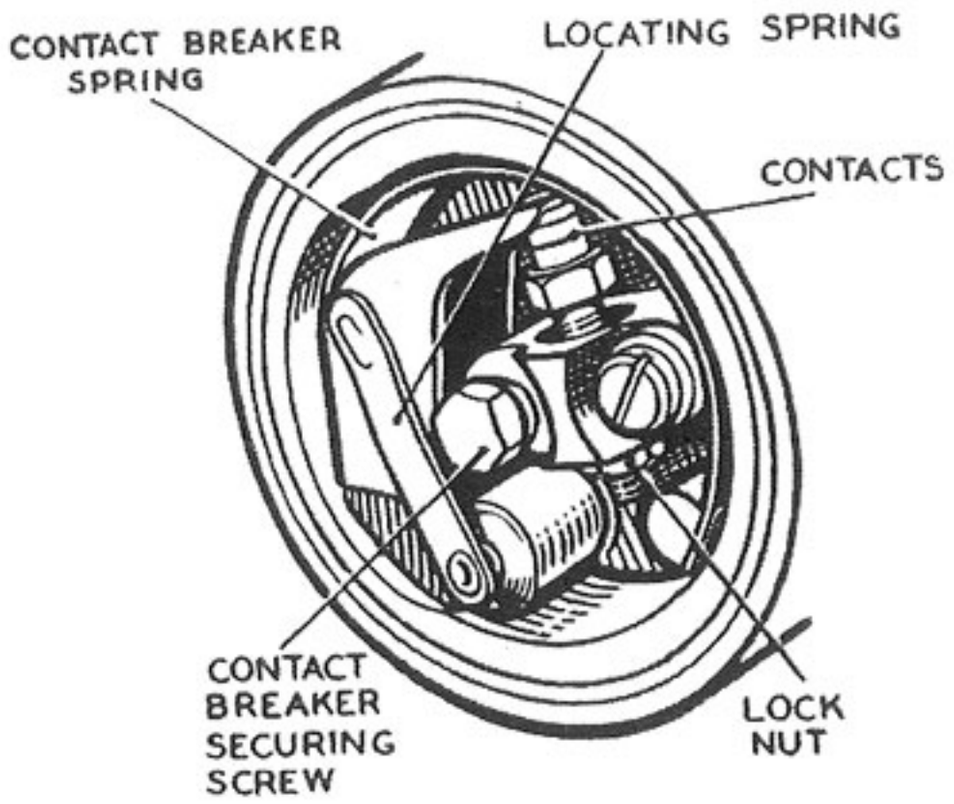


Fig. 2

Remove the cam ring, which is a sliding fit in its housing, and lightly smear inside and outside surfaces with Mobilgrease No. 2. Both removal and refitting of the cam can be made easier if the handlebar control lever is half retarded, thus taking the cam away from its stop pin. Apply one or two drops of thin machine oil to the felt cam lubricator in the housing. Refit the cam, taking care that the stop peg in the housing and the plunger of the timing control engage with their respective slots.

Refit the contact breaker. This can be made easier if the contact breaker heel is away from

the cam lobe; turn the engine until this is so. The key on the projecting part of the contact breaker base must engage with the keyway in the armature shaft. Refit the hexagon headed screw and tighten with care. It must not be slack, neither must undue force be used.

The main bearings of the Magdynos are packed with grease during manufacture and need no attention until a general overhaul is undertaken.

2 (b). Adjustments

Check every 3,000 miles.

(i) Setting contact breaker gap. The contact breaker gap must be set to 0.012 in.-0.015 in. when the contacts are fully separated. To adjust the gap, turn the engine until the contacts are fully opened. Slacken the locking nut of the adjustable contact and turn the contact by its hexagon head until a feeler gauge of appropriate thickness is a sliding fit in the gap. Tighten the lock nut and re-check the gap.

(ii) Adjusting the Timing Control Cable. Any slackness in the cable can be taken up by sliding the waterproofing rubber shroud up the cable and turning the hexagon headed cable adjuster. After adjusting, return the shroud to its original position over the adjuster and central barrel.

2 (c). Cleaning

To be carried out every 6,000 miles. Check the contact breaker contacts and, if necessary, clean them as described in Subsection 2 (a). Wipe the outside of the magneto to remove dirt or grease. Check the cable adjuster and control barrel for signs of water ingress.

Remove the high tension pick-ups and polish with soft dry cloth. The carbon brushes must move freely in their holders. If necessary, clean with a petrol-moistened cloth. Should either brush be worn to within 1/8 in. of the shoulder it must be renewed.

Whilst the pick-up mouldings are removed, clean the slip ring track and flanges by holding a soft dry cloth against them with a suitably-shaped piece of wood while the engine is slowly turned.

The high tension cables must be kept clean and dry.

2 (d). Renewing High Tension Cables

If, on inspection, either high tension cable shows signs of deterioration, it must be replaced, using neoprene covered rubber cable. To fit a new high tension cable, bare the end for about 3/8 in., thread the knurled moulded nut over the cable, and thread the bared cable through the washer removed from the old cable (see Fig. 3).

Bend back the strands radially and screw the nut into the pick-up moulding.

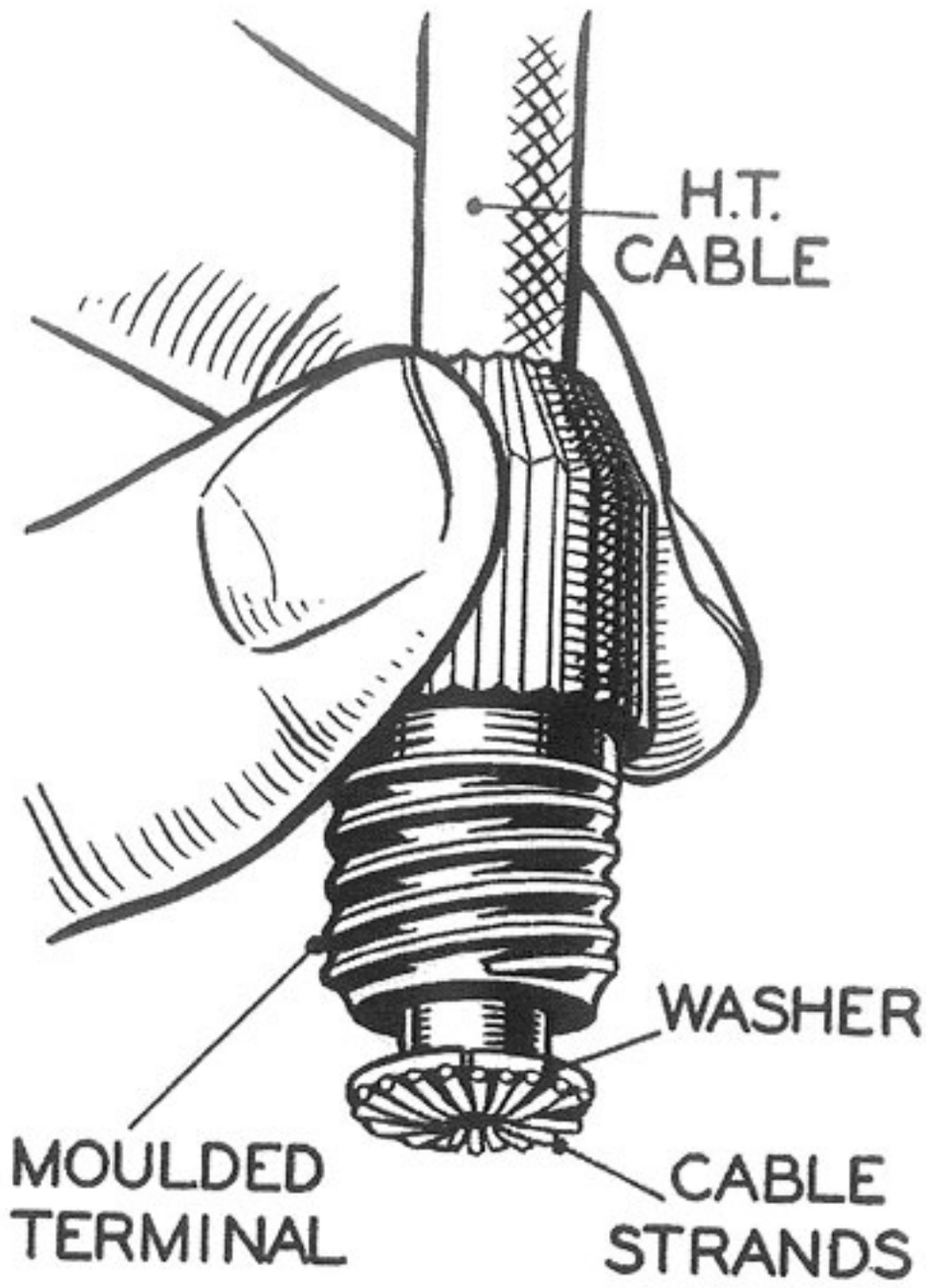


Fig. 3

2 (e). Renewing Timing Control Cable

The Bowden timing control cable should be renewed if it becomes frayed, otherwise moisture may enter the contact breaker housing.

To do this, slip back the rubber shroud and, by means of the hexagon at the base, unscrew the control barrel. If the cable and the plunger to which it is attached are now pulled upwards, the cable nipple can be disengaged from the plunger slot. Soften the solder and remove the nipple.

Thread the new length of cable through the rubber shroud, cable adjuster, control barrel, sealing washer and restoring spring. Solder the nipple to the end of the cable. Engage the nipple with the slot in the plunger and screw the control barrel into the body, ensuring that the sealing washer is correctly fitted between the barrel and the body.

Take up any slackness in the cable by means of the adjuster before refitting the rubber shroud in position.

2 (f). Contact Breaker Spring

The correct contact breaker spring pressure, measured at the contacts, is 18-24 oz.

3. Testing Magdyno in Position on Engine

To locate cause of misfiring or failure of ignition, check as follows:

(i) Remove the sparking plugs from the engine. Hold the ends of the H.T. cables about 1/8 in. from the cylinder block and crank the engine. If strong and regular sparking is produced the fault lies with the sparking plug or plugs which must be cleaned and adjusted or renewed.

(ii) If no sparking is produced at either H.T. cable, examine the faulty cable and, if necessary, renew it as described above in Subsection 2 (d).

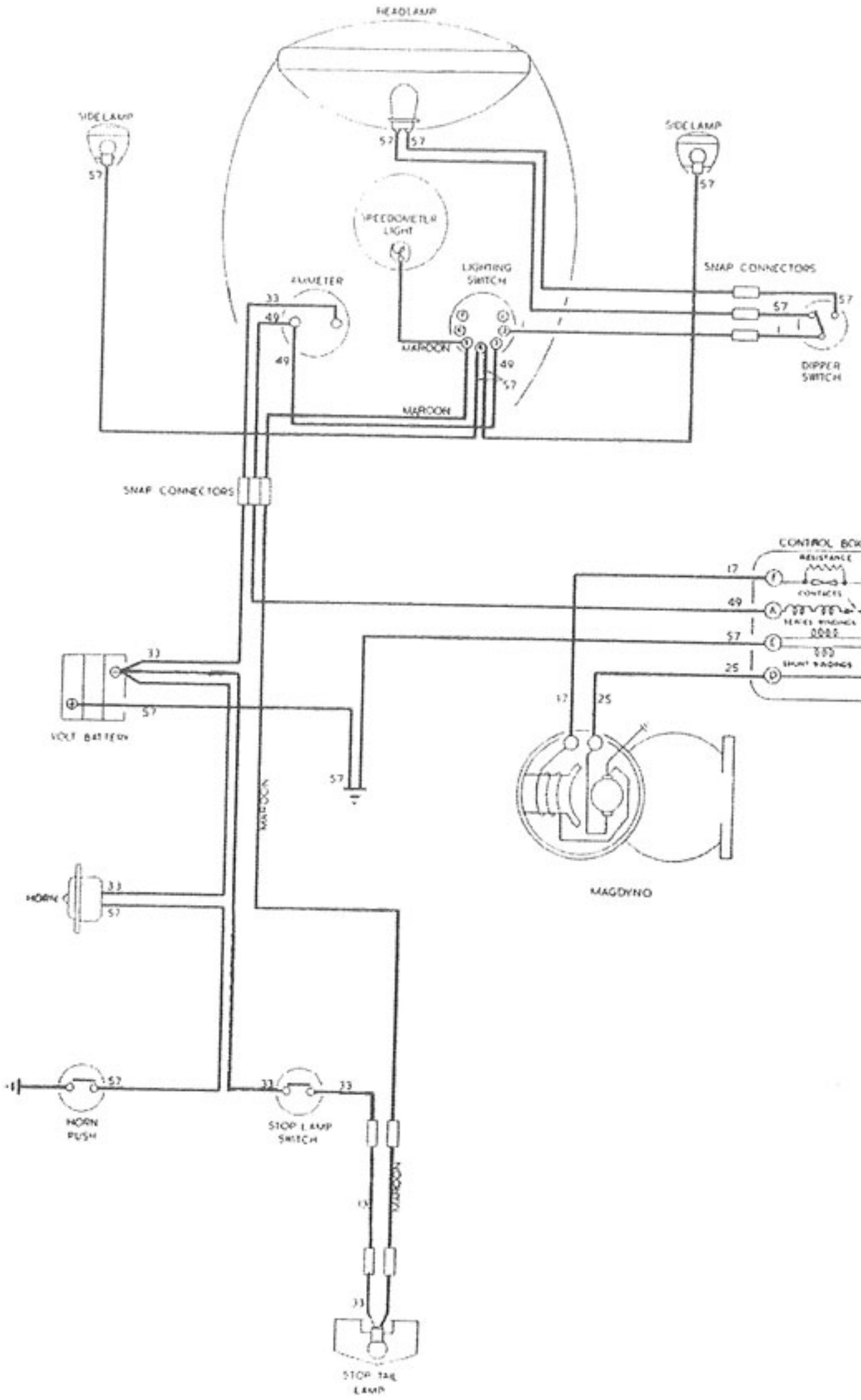
(iii) Very occasionally the fault may be due to a cracked or punctured pick-up moulding. This type of fault is not easily detected by inspection and a check should be made by substitution.

(iv) If an ignition cut-out switch is fitted, disconnect the cable at the magneto and retest. If the Magdyno now functions normally the fault is in either the cable or the cutout switch. Correct by replacement.

(v) If the Magdyno has recently been replaced or removed, it may be incorrectly timed (see Section C1, Subsection 4.)

(vi) Check the contact breaker for cleanliness and correct contact setting as described in Subsection 2 (a).

If the cause of faulty operation cannot be traced from the foregoing checks, the cause may be an internal defect in the Magdyno. The Magdyno should therefore be removed from the engine for attention by a Lucas Agent.



KEY TO CABLE COLOURS

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66 LIGHT GREEN

WIRING DIAGRAM
Fig. 4

SECTION G2a

Lucas Dynamo Model C35SD

Used on " 500 Twin," "Meteor 700 " up to end of 1954

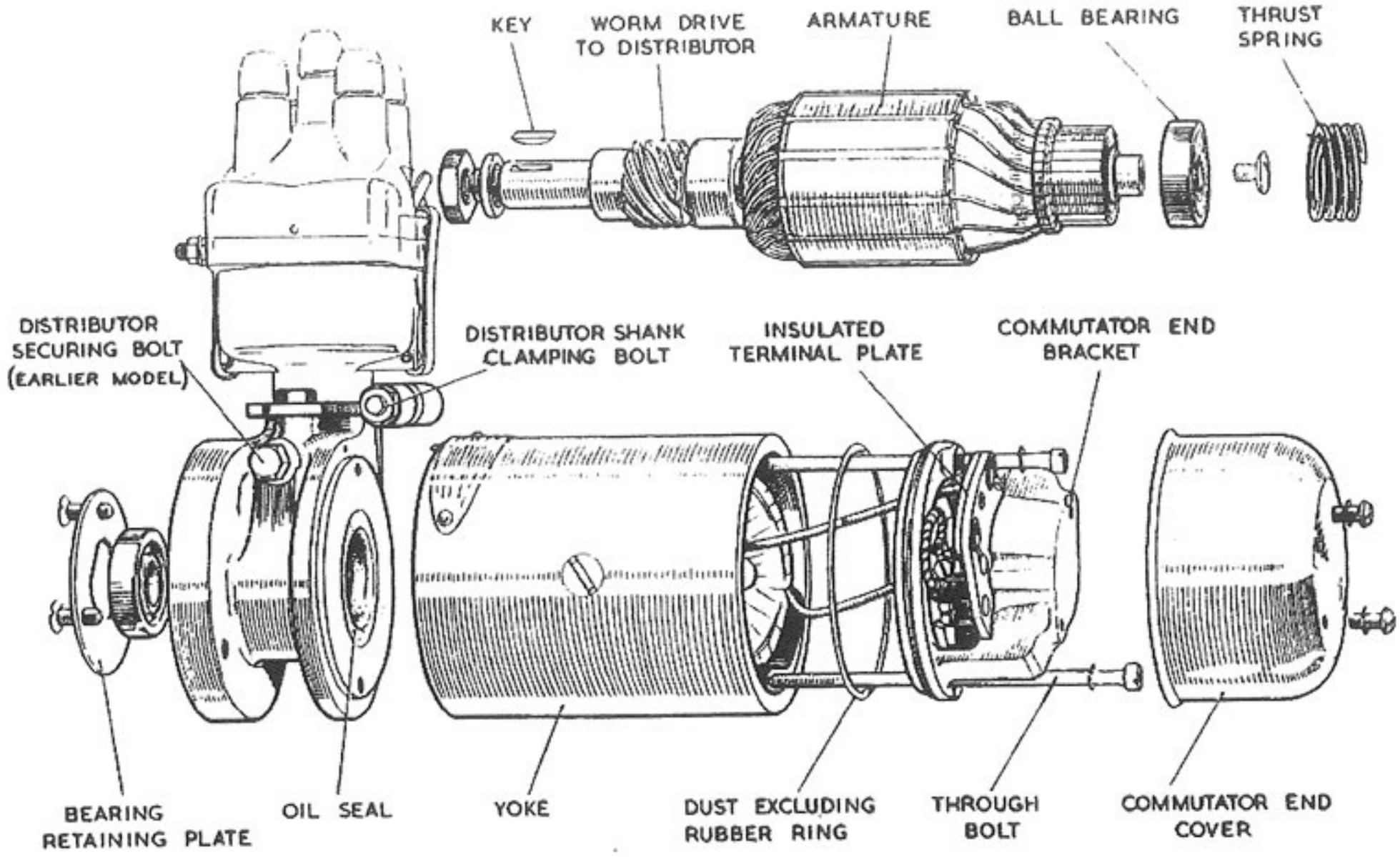


Fig. 1

1. General

The dynamo is a shunt-wound two-pole machine, arranged to work in conjunction with a regulator unit to give an output which is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the dynamo gives a high output, whereas if the battery is fully charged, the dynamo gives only a trickle charge to keep the battery in a good condition without overcharging. In addition, an increase of output is given to balance the current taken by the lamps when in use.

Model C35SD has both the drive and the commutator ends of the armature supported in ball bearings. The arrangement of the commutator end bearing has been modified on later dynamos. In earlier dynamos a thrust spring was fitted between the commutator and the inner journal of the bearing. In later dynamos (see Fig. 1) the bearing is secured to the armature shaft by a screw and the thrust spring, now loading the outer journal of the bearing, is fitted in the bearing housing in the commutator end bracket. Mounted on the drive end bracket of the dynamo is a distributor (see Section G1a) driven via a worm gear and pinion from the armature shaft. The output of the dynamo is 75 watts.

2 (a). Lubrication

No lubrication is necessary as the ball bearings are packed with H.M.P. grease which will last until the machine is taken down for a general overhaul, when the bearings should be repacked.

2 (b). Inspection of Commutator and Brushgear

About once every six months remove the cover band for inspection of commutator and brushes, see Subsection 4 (a) (vi).

3. Test Data

Cutting-in Speed (Dynamo Cold)	Output Test	Field Resistance	Brush Spring Tension
1,000-1,150 r.p.m. at 6.5 volts	10 amps. at 1,700-1,850 r.p.m. at 7 volts*	2.6-2.8 ohms	16-20 oz.

*On resistance load of 0-7 ohm.

4 (a). Testing in Position to Locate Fault in Charging Circuit

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of the trouble.

(i) Check that the dynamo and regulator units are connected correctly. The dynamo terminal "D" should be connected to the regulator unit terminal "D" and dynamo terminal "F" to regulator terminal "F."

(ii) Remove the cables from the dynamo terminals "D" and "F" and connect the two terminals with a short length of wire.

(iii) Start the engine and set to run at normal idling speed.

(iv) Connect the negative lead of a moving coil voltmeter, calibrated 0-10 volts, to one of the dynamo terminals and connect the positive lead to a good earthing point on the dynamo yoke or engine.

(v) Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to rise above 10 volts and do not race the engine in an attempt to increase the voltage. It is sufficient to run the dynamo up to a speed of 1,000 r.p.m. If there is no reading, check the brush gear, as described in (vi) below. If there is a low reading of approximately 1/2 volt, the field winding may be at fault, see Subsection 4 (d). If there is a reading of approximately 1.1/2 to 2 volts, the armature winding may be at fault, see Subsection 4 (e).

(vi) Remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they do not bear on the commutator or if the brush flexible is exposed on the running face, new brushes must be fitted.

Test the brush spring tension with a spring scale (see Fig. 2). The correct tension is 16-20 oz. and new springs must be fitted if the tension is low.

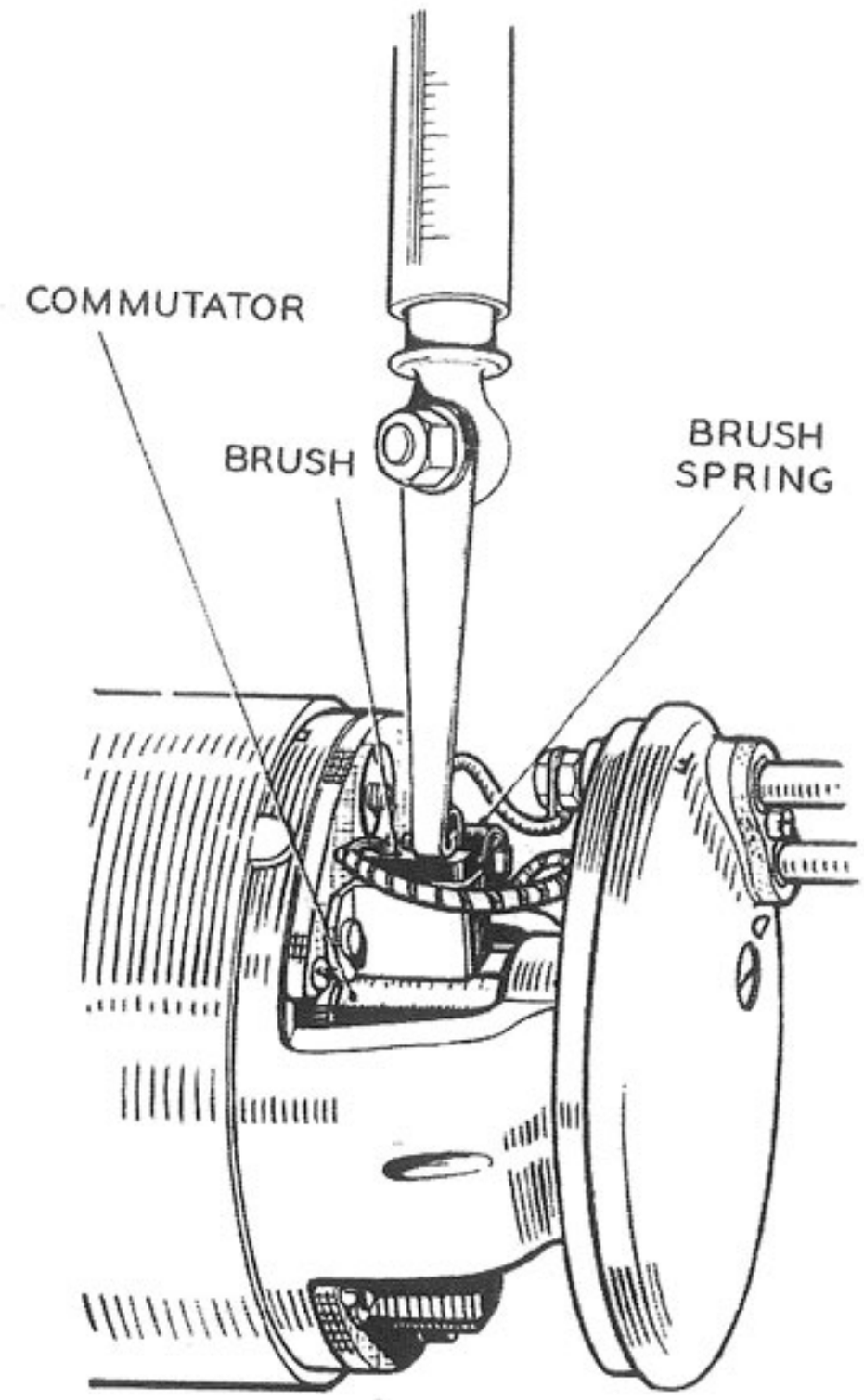


Fig. 2

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by means of the kick start (with sparking plugs removed).

Re-test the dynamo as in (v) above. If there is still no reading on the voltmeter, there is an internal fault and the complete unit should be replaced if a spare is available. Otherwise the unit must be dismantled, see Subsection 4 (b) for internal examination.

(vii) If the dynamo is in good order, restore the original connections. Connect regulator unit

terminal "D" to dynamo terminal "D" and regulator terminal "F" to dynamo terminal "F" and check the regulator.

4 (b). To Dismantle

Remove the dynamo and distributor from the motor cycle. To detach the distributor from the dynamo drive end bracket, loosen the distributor shank clamping bolt and withdraw the complete unit from the bracket (see Fig. 1). On earlier models an additional securing bolt is located in the drive end bracket and must be loosened a few turns to allow the distributor to be withdrawn from the bracket. Proceed to dismantle as follows :-

(i) Remove the securing nut from the drive end of the armature shaft and withdraw the sprocket with the aid of an extractor. Knock out the key from the armature shaft.

(ii) Unscrew the two commutator end cover securing screws and remove the cover. Hold back the brush springs and lift the brushes from their holders.

(iii) Disconnect the earthed field connection and unsolder the field connection to terminal "F" on the terminal strip.

(iv) Unscrew and remove from the commutator end bracket the two through bolts securing the end bracket and yoke to the drive end bracket.

(v) Draw the commutator end bracket away from the armature and separate the yoke from the drive end bracket. On earlier models a thrust spring will be found around the armature shaft (on later models it is located between the ball bearing and the housing); take care not to lose this.

(vi) The armature can now be pressed out of the drive end bearing, taking great care not to damage the sealing lip of the rubber oil seal.

(vii) Unscrew the two screws on the inner side of the commutator end bracket which secure the insulated terminal plate carrying the terminals and brushgear. On earlier models removal of the insulating plate will reveal the bearing retaining plate and thrust spring housing.

4. (c) Commutator

Examine the commutator. If it is in good condition, it will be smooth and free from pits or burnt spots. Clean with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of very fine glass paper while rotating the armature. To remedy a badly worn commutator, mount the armature with or without the drive end bracket in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glass paper.

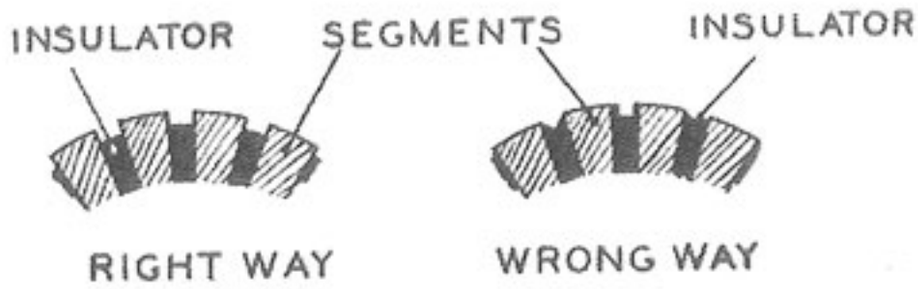


Fig. 3

Undercut the insulation between the segments to a depth of 1/32 in. with a hacksaw blade ground down until it is only slightly thicker than the insulation (see Fig. 3).

4 (d). Field Coil

Measure the resistance of the field winding by means of an ohm-meter. If this is not available, connect a 6-volt D.C. supply with an ammeter in series with the coil. The ammeter reading should be approximately 2 amps. No reading on the ammeter indicates an open circuit in the field winding.

To check for an earthed coil, connect a mains test lamp between one end of the coil and the yoke. If the bulb lights, there is an earth between coil and yoke.

In either case, unless a replacement dynamo is available, the field coil must be replaced but this should only be attempted if a wheel-operated screwdriver and pole shoe expander are at hand, the latter being especially necessary to ensure that there will be no air gap between the pole shoe and the inner face of the yoke.

To replace the field coil, proceed as follows :

(i) Unscrew the pole shoe retaining screw by means of the wheel-operated screwdriver (see Fig. 4).

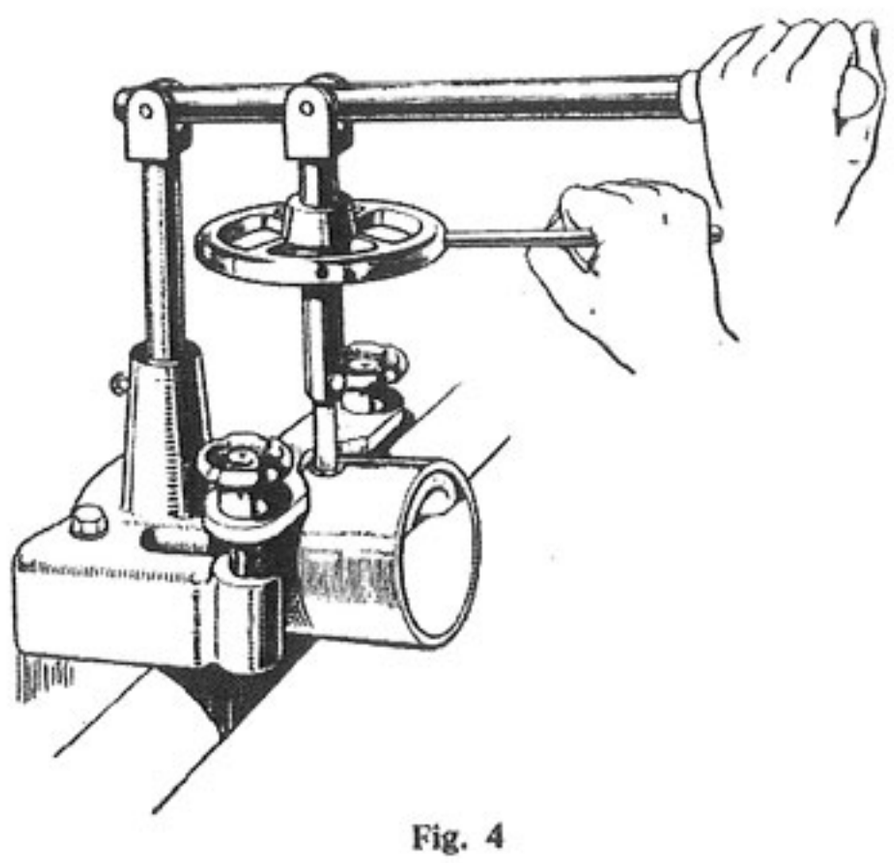


Fig. 4

(ii) Draw the pole shoe and field coil out of the yoke and lift off the coil.

(iii) Fit the new field coil over the pole shoe and place it in position inside the yoke. Take care to ensure that the taping of the field coil is not trapped between the pole shoe and the yoke.

(iv) Locate the pole shoe and field coil by lightly tightening the fixing screw, insert the pole shoe expander (see Fig. 5), open to its fullest extent and tighten the screw. Remove the expander and give the screw a final tightening with the wheel-operated screwdriver. Lock the screw in position by caulking, that is, by tapping some of the metal of the yoke into the slot in the head of the screw.

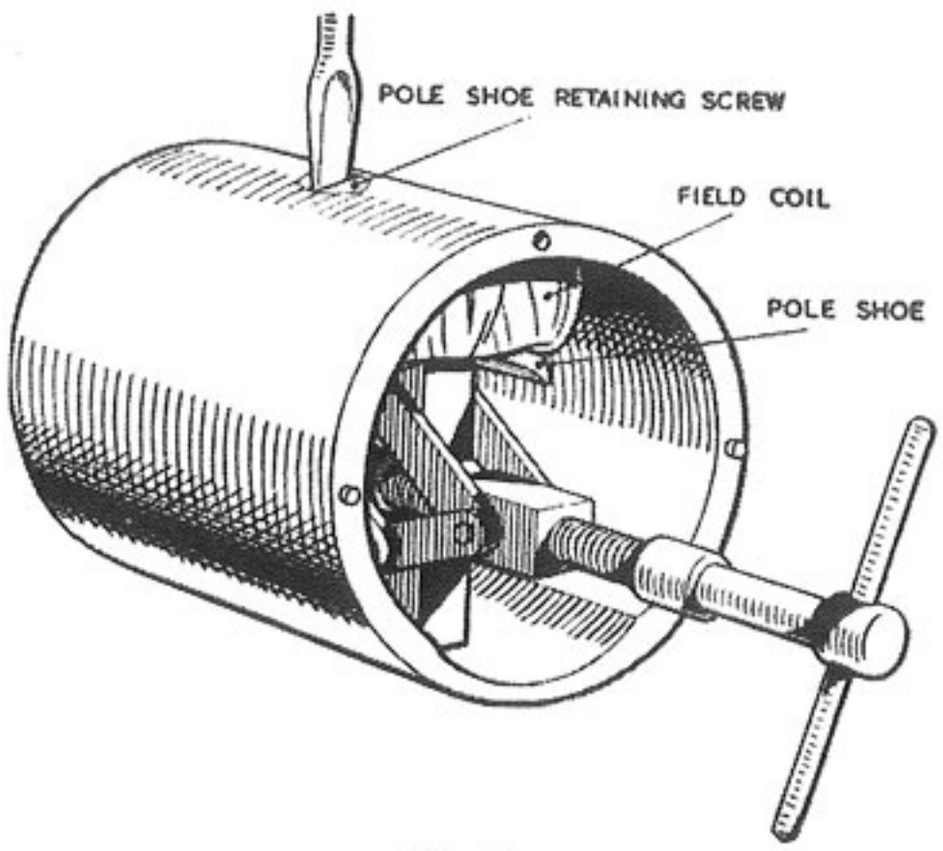


Fig. 5

4 (e). Armature

The testing of the armature winding requires the use of a voltdrop test or a growler. If these are not available, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

4 (f). Bearings

Ball bearings are fitted to both the commutator and drive end brackets. When the bearings become worn to such an extent that they allow side movement of the armature shaft, they must be replaced (see Figs. 6 and 7). The bearings should not be disturbed except for the purpose of replacement. To replace the ball bearing at the drive end proceed as follows :-

(i) Remove the bearing retaining plate from the drive end bracket by unscrewing the three countersunk screws.

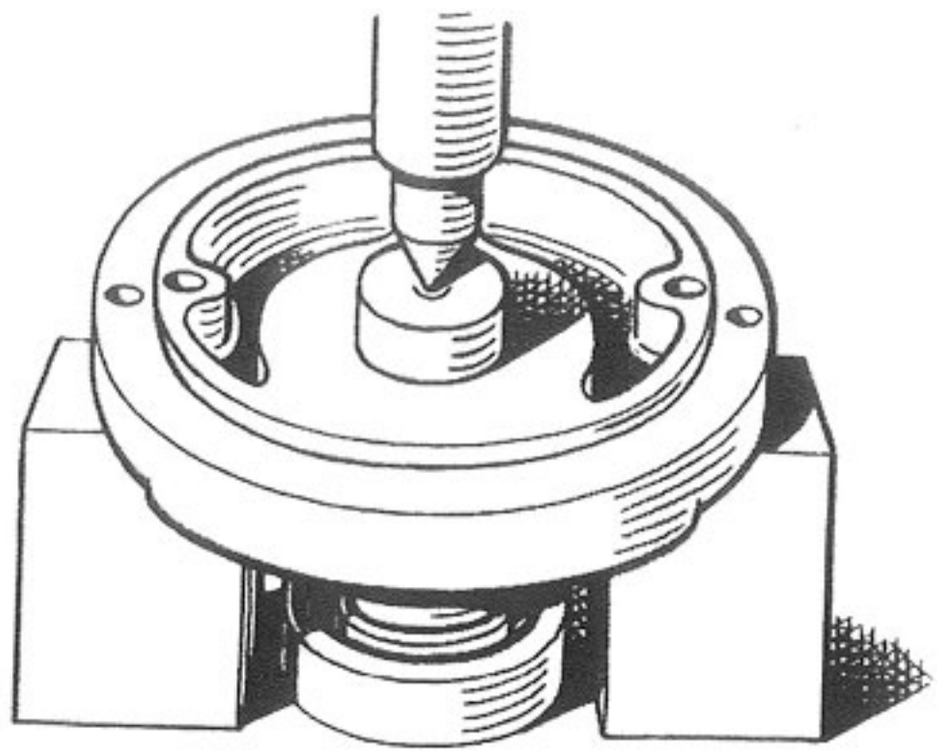


Fig. 6

(ii) Press the defective bearing out of the end bracket. Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Position the bearing in its housing and press it squarely home, applying pressure on the outer journal of the bearing.

To replace the ball bearing at the commutator end, proceed as follows:

Earlier Type

(i) Using an expanding caliper-type extractor, draw the bearing from its housing in the commutator end bracket.

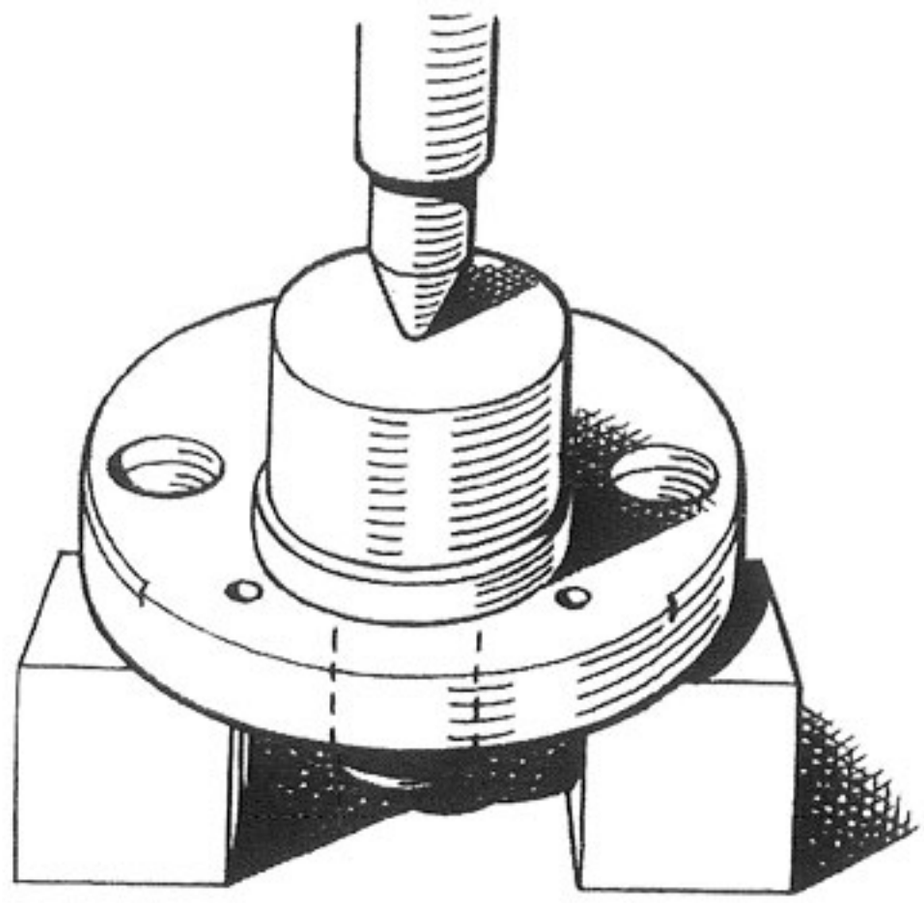


Fig. 7

(ii) Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Position the new bearing in its housing and press it squarely home, applying pressure on the outer journal of the bearing.

Later Types

(i) To remove the bearing slacken and withdraw the thrust screw and pull the bearing off the armature shaft with an extractor.

(ii) Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Force the new bearing home against the shoulder on the armature shaft. Insert and tighten the thrust screw.

4 (g). Reassembly

In the main the reassembly of the dynamo is a reversal of the operation described in Subsection 4 (b), bearing in mind the following points : -

(i) The field coil lead fitted with the short length of yellow tubing must be connected, together with the eyelet of the earthed brush, to the commutator end bracket by means of the screw provided.

(ii) The second field coil lead must be connected to terminal "F" on the moulded cap.

(iii) The unearthed brush flexible lead must be connected direct to terminal "D" on the moulded end cap.

(iv) Take care to refit the cover band in its original position and make sure that the securing screw, when of flush-fitting pattern, does not "short" on the brushgear.

(v) Take care not to damage the oil seal. If damage is caused a new seal must be fitted.

5. Dynamo Polarity

If a dynamo has been incorrectly connected on the motor cycle and its polarity has become reversed, it must be re-polarised.

To do this, fit the dynamo to the motor cycle but do not at this stage connect the cable to the "D" and "F" terminals. Temporarily connect a length of wire to the battery negative terminal (the positive terminal being earthed) and hold the other end of this wire in contact with dynamo terminal "F" for a few seconds only. This serves to re-polarize the dynamo. The temporary connection can now be removed and the original cables connected to "D" and "F" terminals.

The practice of closing the cut-out points to reverse the dynamo polarity is not recommended, as this method allows a high initial surge of current from the battery to pass through the armature, which can damage the windings, insulation, etc. and result in a decreased service life of the machine.

All Royal Enfield "500 Twin" and "Meteor 700" motor cycles should have the positive terminal of the battery earthed to the frame.

SECTION G2b

Lucas Dynamo Model E3LM

Used on all Models fitted with Magdyno

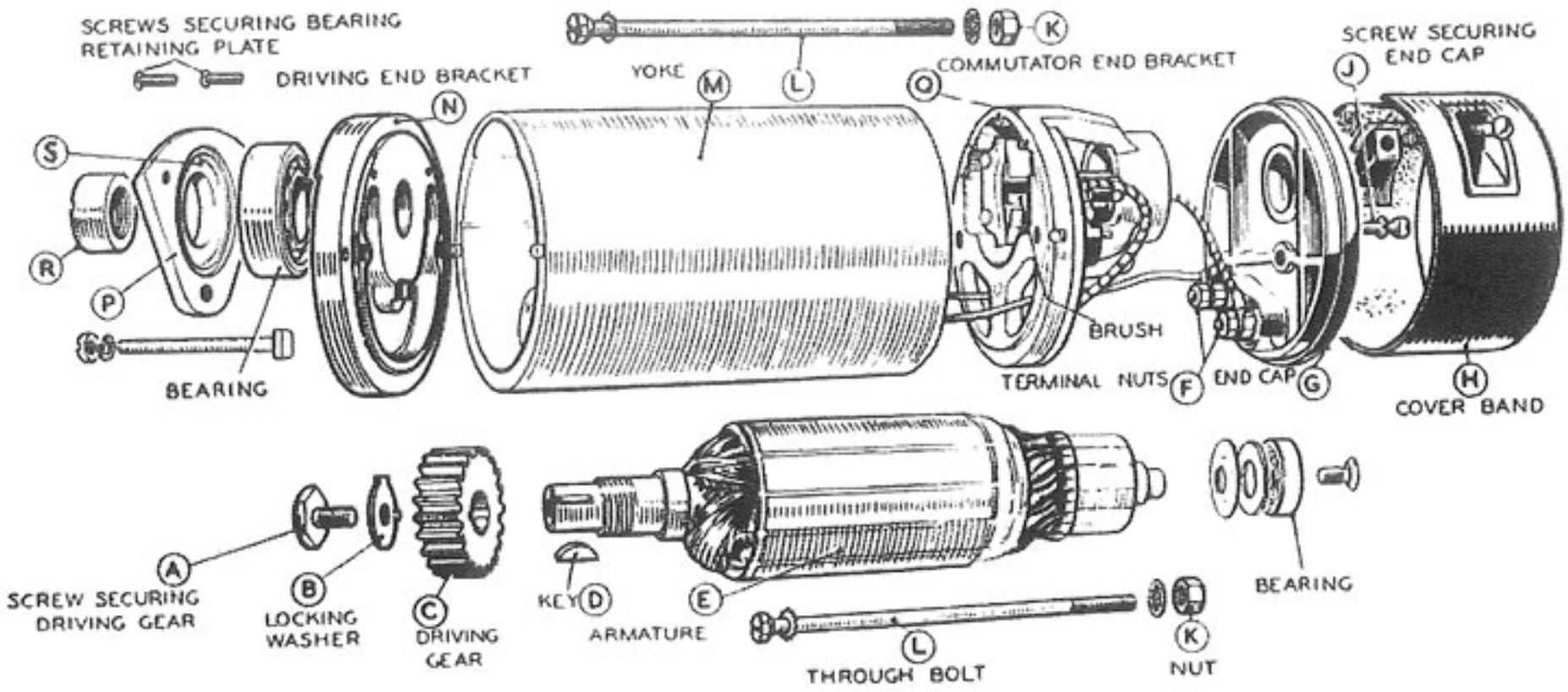


Fig. 1

1. General

The dynamo is a shunt-wound two-pole machine, arranged to work in conjunction with a regulator unit to give an output which is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the dynamo gives a high output, whereas, if the battery is fully charged, the dynamo gives only a trickle charge to keep the battery in a good condition without overcharging. In addition, an increase of output is given to balance the current taken by the lamps when in use. Model E3LM (see Fig. 1) is designed to be the upper portion of the "Magdyno" and has an output of 60 watts.

2 (a). Lubrication

No lubrication is necessary, as the ball bearings are packed with H.M.P. grease, which will last until the machine is taken down for a general overhaul, when the bearings should be repacked.

2 (b). Inspection of Commutator and Brush Gear

About once every six months remove the cover band for inspection of commutator and brushes, see Subsection 4(a) (vi).

3. Test Data

Cutting-in speed (Dynamo Cold)
1,050 – 1,200 r.p.m. at 7 volts

Output test
8.5 amps at 1,850 – 2,000 r.p.m. at 7 volts*

Field resistance
2.8 ohms

Brush spring tension
16 – 20 oz.

*On resistance load of 0.82 ohm.

4 (a). Testing in Position to Locate Fault in Charging Circuit

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of trouble.

(i) Check that the dynamo and regulator units are connected correctly. The dynamo terminal "D" should be connected to the regulator unit terminal "D" and dynamo terminal "F" to regulator terminal "F."

(ii) Remove the cables from the dynamo terminals " D " and " F " and connect the two terminals with a short length of wire.

(iii) Start the engine and set to run at normal idling speed.

(iv) Connect the negative lead of a moving coil voltmeter, calibrated 0-10 volts, to one of the dynamo terminals and connect the positive lead to a good earthing point on the dynamo yoke or engine. Reverse voltmeter connections on negative earth machines.

(v) Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to rise above 10 volts and do not race the engine in an attempt to increase the voltage. It is sufficient to run the dynamo up to a speed of 1,000 r.p.m. If there is no reading, check the brush gear, as described in (vi) below. If there is a low reading of approximately 1/2 volt, the field winding may be at fault, see Subsection 4(d). If there is a reading of approximately 1.1/2 to 2 volts, the armature winding may be at fault, see Subsection 4 (e).

(vi) Remove the cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they do not bear on the commutator or if the brush flexible is exposed on the running face, new brushes must be fitted.

Test the brush spring tension with a spring scale (see Fig. 2). The correct tension is 16 - 20 oz. and new springs must be fitted if the tension is low.

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by means of the kick start, with sparking plug(s) removed.

Re-test the dynamo as in (v) above. If there is still no reading on the voltmeter there is an internal fault and the complete unit should be replaced if a spare is available. Otherwise the unit must be dismantled, see Subsection 4 (b) for internal examination.

(vii) If the dynamo is in good order, restore the original connections. Connect regulator unit terminal "D" to dynamo terminal "D" and regulator terminal "F" to dynamo terminal "F" and check the regulator.

4 (b). To Dismantle

Remove the dynamo from the motor cycle. To detach the dynamo from the Magdyno, unscrew the hexagon headed nut from the driving end cover and slacken the screws securing the band clip.

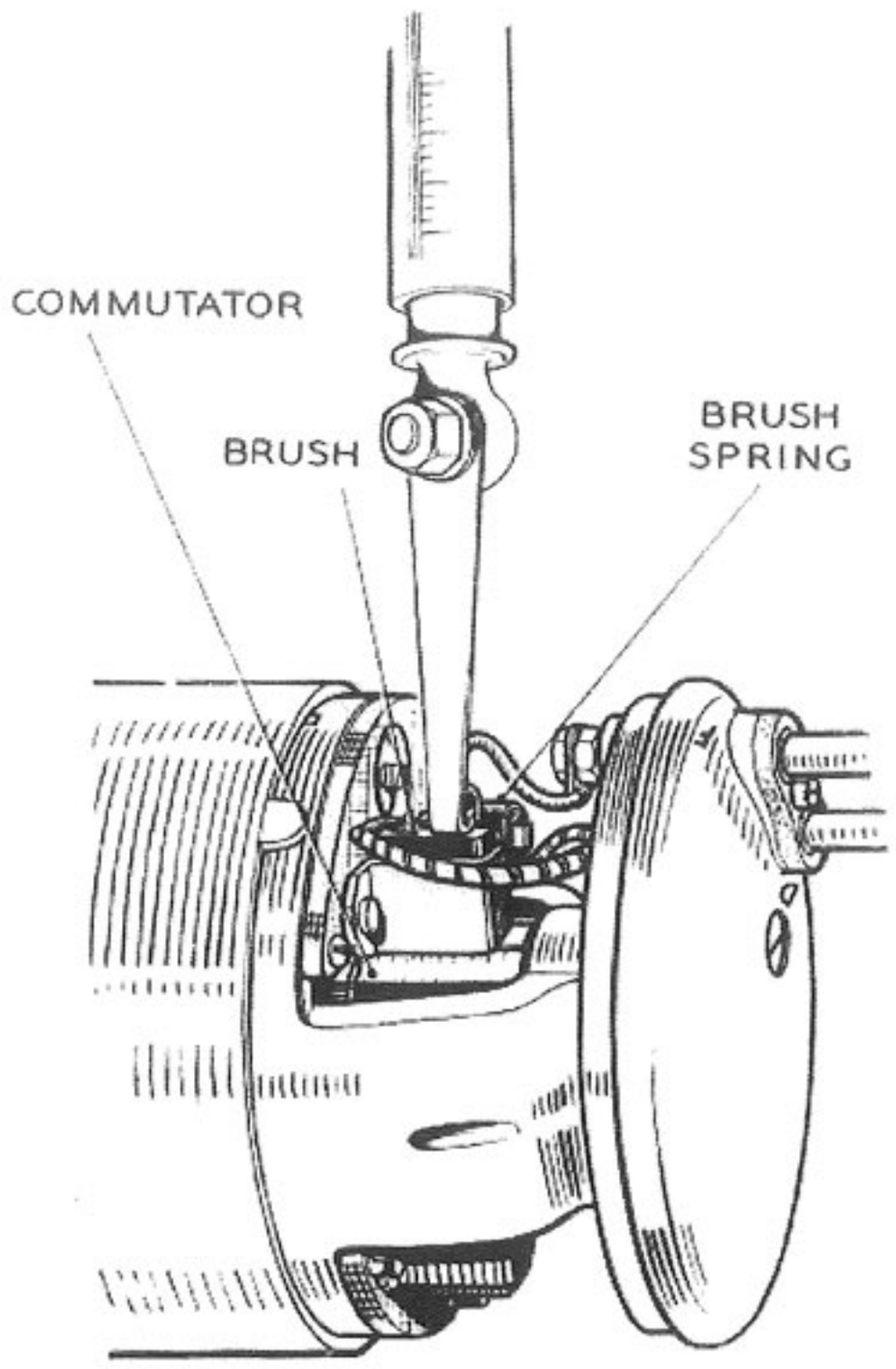


Fig. 2

To dismantle the dynamo proceed as follows: Bend back the tag on the washer "B" locking the screw "A" (see Fig. 1). Remove this screw, withdraw the gear "C" from the shaft with the aid of an extractor and remove the key(s) "D" from the shaft.

(ii) Remove the cover band "H," hold back the brush springs and lift the brushes from their holders.

(iii) Take out the screw "J" with spring washer from the centre of the black moulded end cap "G." Draw the cap away from the end bracket, take off terminal nut "F" and spring washer, and lift the connections off the terminals.

(iv) Unscrew and remove from the drive end bracket the two through bolts "L"securing the drive end bracket "N" and commutator end bracket "Q" to the yoke "M." Hold the nuts "K"

at the commutator end while unscrewing the bolts and take care not to lose the nuts.

(v) Draw the drive end bracket complete with armature "E" out of the yoke.

(vi) Remove the nut "R" and press the armature out of the drive end bracket by means of a hand press.

(vii) Remove the bearing retaining plate "P" from the end bracket. This is secured by two screws and a long threaded bolt.

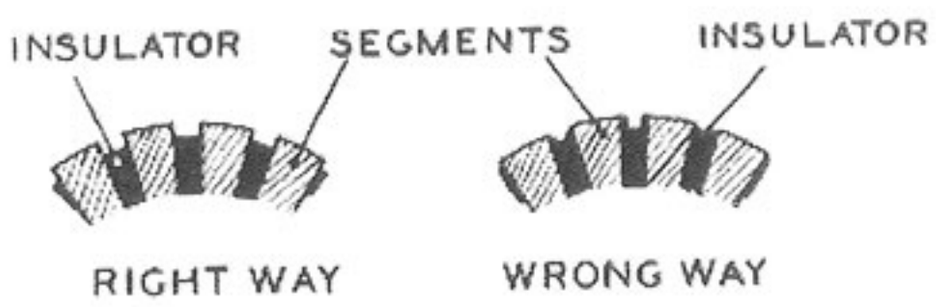


Fig. 3

(viii) Take out the screw securing the green field coil lead with the yellow sleeve to commutator end bracket and remove the end bracket "Q" withdrawing the connectors through the slot in the insulating plate.

(ix) Unscrew the three screws securing the insulating plate to the commutator end bracket and remove the plate with brush gear.

4 (c). Commutator

Examine the commutator. If it is in good condition it will be smooth and free from pits or burnt spots. Clean with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of very fine glass paper while rotating the armature.

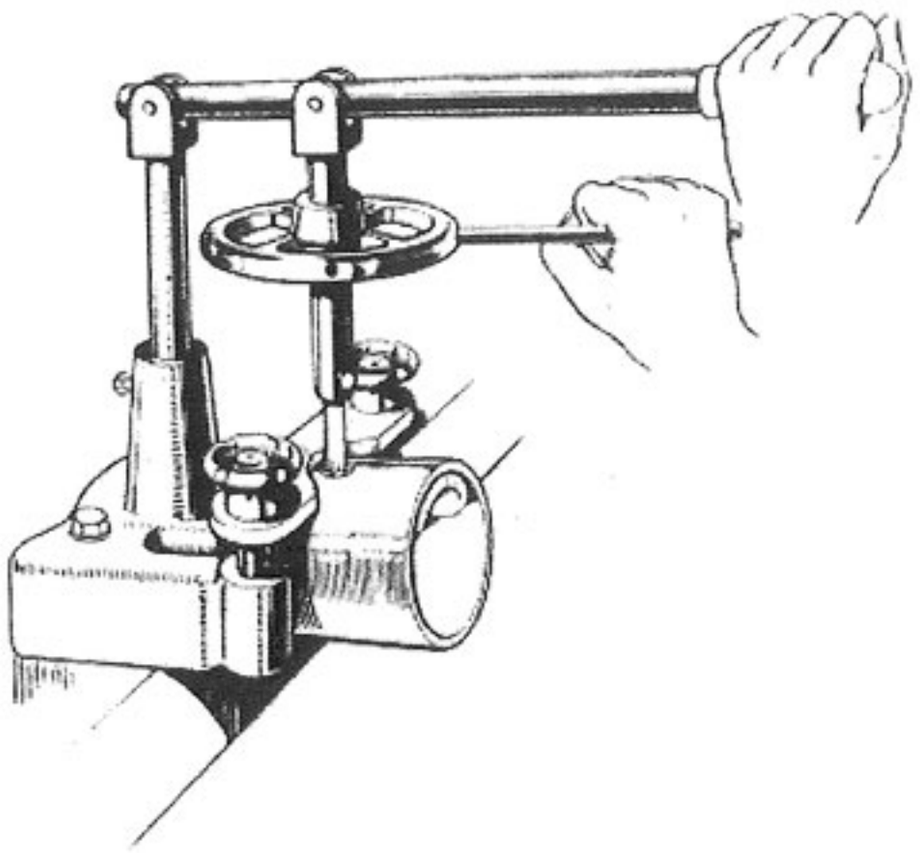


Fig. 4

To remedy a badly worn commutator, mount the armature with or without the drive end bracket in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glass paper.

Undercut the insulation between the segment, to a depth of 1/32 in. with a hacksaw blade ground down until it is only, lightly thicker than the insulation (see Fig. 3.)

4 (d) Field Coil

Measure the resistance of the held winding by means of an ohm-meter. It this is not available connect a 6-volt D.C. supply with an ammeter in series with the coil. The ammeter reading should be approximately 2 amps. No reading on the ammeter indicates an open circuit in the field winding.

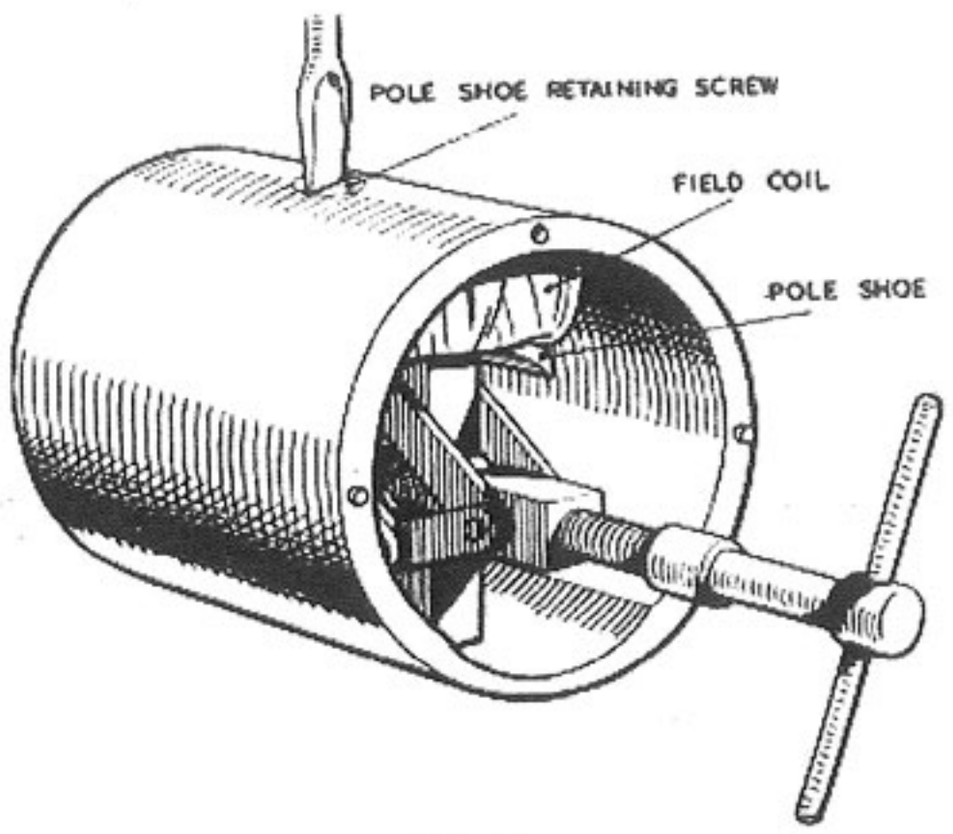


Fig. 5

To check for an earthed coil, connect a main, test lamp between one end of the coil and the yoke. If the bulb lights, there is an earth between coil and yoke.

In either case, unless a replacement dynamo is available, the field coil must be replaced but this should only be attempted if a wheel-operated screwdriver and pole shoe expander are at hand, the latter being especially necessary to ensure that there will be no air gap between the pole shoe and the inner face of the yoke.

To replace the field coil, proceed as follows

(i) Unscrew the pole shoe retaining screw by means of the wheel-operated screwdriver (see Fig. 4).

(ii) Draw the pole shoe and field coil out of the yoke and lift off the coil.

(iii) Fit the new field coil over the pole shoe and place it in position inside the yoke. Take care to ensure that the taping of the field coil is not trapped between the pole shoe and the yoke.

(iv) Locate the pole shoe and field coil by lightly tightening the fixing screw, insert the pole shoe expander (see Fig. 5), open to its fullest extent and tighten the screw. Remove the expander and give the screw a final tightening with the wheel-operated screwdriver. Lock the screw in position by caulking, that is, by tapping some of the metal of the yoke into the slot in the head of the screw.

4. (e). Armature

The testing of the armature winding requires the use of a voltdrop test or a growler. If these are not available, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

4 (f). Bearings

Ball bearings are fitted to both the commutator and drive end brackets. When the bearings become worn to such an extent that they allow side movement of the armature shaft, they must be replaced. To replace the ball bearing at the commutator end proceed as follows :

(i) Remove the screw from the end of the armature shaft and, using a caliper type extractor, draw the bearing off the shaft.

(ii) Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Position the bearing on the end of the shaft and press it squarely home, applying pressure on the inner journal of the bearing.

To replace the ball bearing at the drive end proceed as follows :

(i) Remove the bearing retaining plate from the drive end bracket as previously described.

(ii) Press the bearing out of the end bracket, using a metal drift locating on the inner journal of the bearing. Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

(iii) Position the bearing in its housing and press it squarely home, applying pressure on the outer journal of the bearing.

4 (g). Reassembly

In the main, the reassembly of the dynamo is a reversal of the operation described in Subsection 4(b), bearing in mind the following points :

(i) The field coil lead fitted with the short length of yellow tubing must be connected, together with the eyelet of the earthed brush, to the commutator end bracket by means of the screw provided.

(ii) The second field coil lead must be connected to terminal "F" on the moulded cap (see Fig. 6).

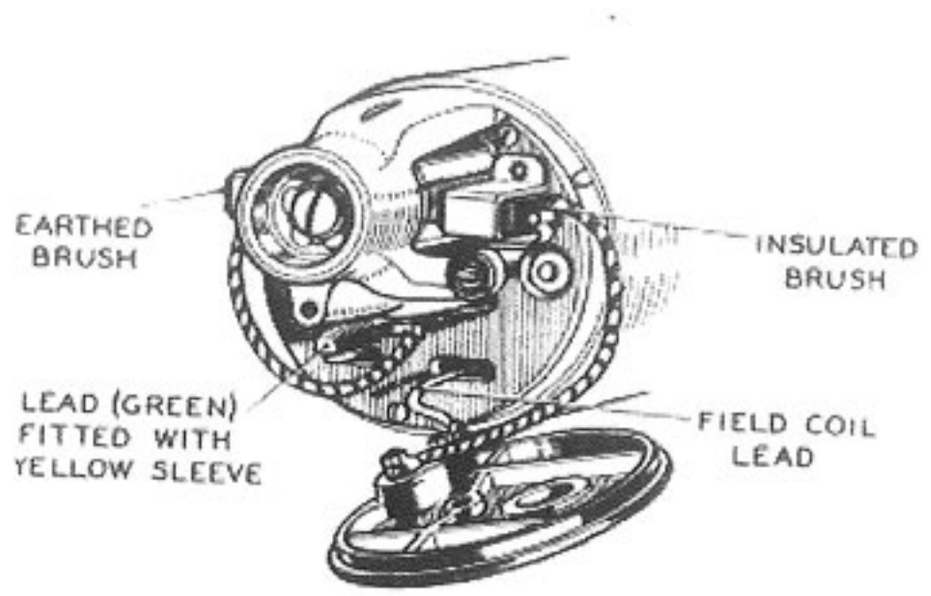


Fig. 6

(iii) The unearthed brush flexible lead must be connected direct to terminal "D" on the moulded end cap.

(iv) Take care to refit the cover band in its original position and make sure that the securing screw, when of flush-fitting pattern, does not "short" on the brush gear.

5. Dynamo Polarity

All replacement motor cycle dynamos are despatched from the Works suitable for immediate use on positive earth systems. If the negative terminal of the battery is earthed on the machine for which the replacement dynamo is intended, it will be necessary to re-polarize the dynamo before use to make it suitable for negative earth.

Similarly, if a dynamo has been incorrectly connected on the motor cycle and its polarity has become reversed, then it must be re-polarized.

To do this, fit the dynamo to the motor cycle but do not at this stage connect the cable to the "D" and "F" terminals. Temporarily connect a length of wire to the unearthed terminal of the battery and hold the other end of this wire in contact with dynamo terminal "F" for a few seconds only. This serves to re-polarize the dynamo. The temporary connection can now be removed and the original cables connected to "D" and "F" terminals.

The practice of closing the cut-out points to reverse the dynamo polarity is not recommended, as this method allows a high initial surge of current from the battery to pass through the armature, which can damage the windings, insulation, etc. and result in a decreased service life of the machine.

Generally speaking, Enfield motorcycles manufactured up to and including 1951 had the negative terminal of the battery connected to the frame. With a few exceptions, i.e. Miller coil ignition sets and rectifier sets on two-stroke machines, all Royal Enfield machines in current production have the positive terminal earthed.

SECTION G3a

Control Box

Used on Models G, J2, "350 Bullet," "500 Bullet," "500 Twin," "Meteor 700," 1950 onwards

MODEL RB107

1. General

In Model RB107 control box, the regulator and cut-out contacts are positioned, for ease of access, above their respective armatures. It will be noticed that some of the internal electrical joints are resistance brazed.

2. Setting Data

(a) Cut-out

Cut-in voltage ..... 6.3-6.7 volts
Drop-off voltage .... 4.8-5.3 volts

(b) Regulator

Setting on open circuit relative to ambient temperature :

10° C. (50° F.) .... 7.7-8.1 volts
20° C. (68° F.) .... 7.6-8.0 volts
30° C. (86° F.) .... 7.5-7.9 volts
40° C (104° F.) .... 7.4-7.8 volts

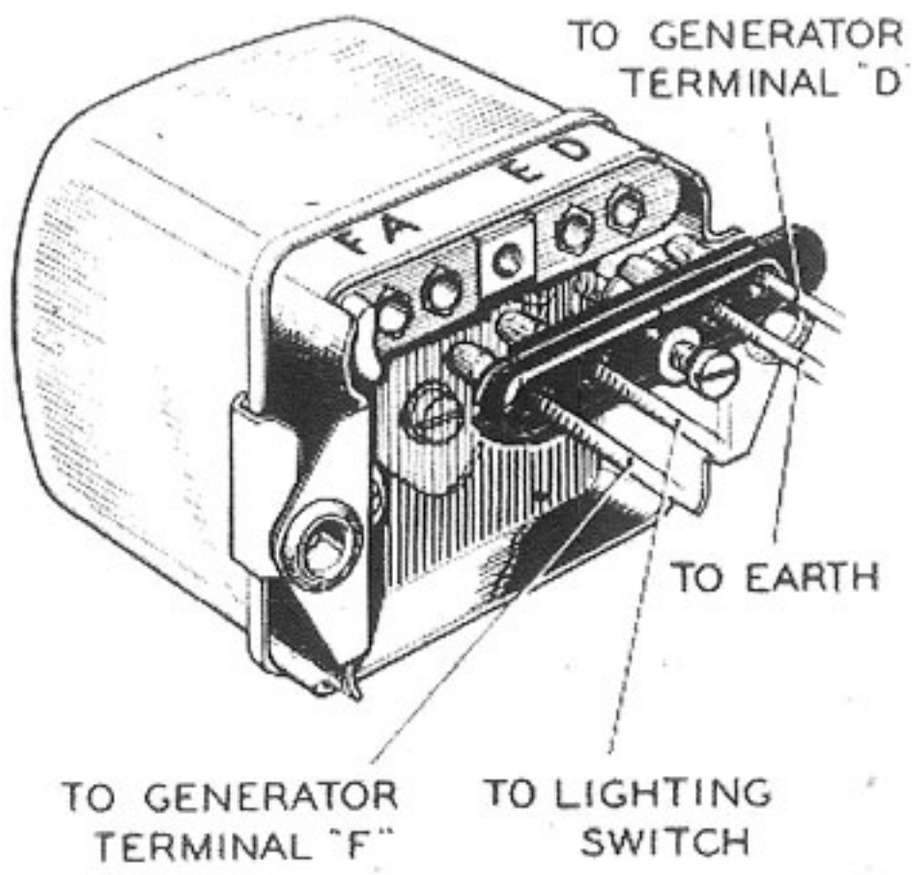


Fig. 1

3. Servicing

Before making any adjustment to the regulator, ensure that the dynamo and battery are in order. When a sound battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, the following procedure should be adopted :

(a) Checking the wiring between battery and regulator

Remove the control box from its mountings and withdraw the cable from terminal "A" (see Fig. 1) and connect it to the negative terminal of a voltmeter.

Connect the positive terminal of the voltmeter to an earthing point on the machine. If a voltmeter reading is given, the circuit from the battery to terminal "A" is in order.

If there is no voltmeter reading, examine the wiring between the battery and the control box for defective cables or loose connections. Re-connect the cable to terminal "A."

Check that the dynamo terminal "D" is connected to control box terminal "D"and that the cable is in good condition. Similarly, check the cable between terminals "F" at the dynamo and control box.

(b) Checking the electrical setting of the regulator

The regulator is carefully set during manufacture and, in general, it should not be necessary to make further adjustment. If, however, the charging system is suspected it is important that only a good quality moving coil voltmeter (0-20 volts) is used to check the system. The electrical setting of the regulator can be checked without removing the cover from the control box.

Withdraw the plug-in connectors a small distance, so that a voltmeter connection can be made to terminals "D" and "E."

Connect the negative lead of the voltmeter to control box terminal "D" and the positive lead to terminal "E."

Remove the negative terminal from the battery. If coil ignition is fitted, run a temporary connection from the negative terminal of the battery to the "SW" terminal of the coil.

With the ignition switch in the "OFF" position, start the engine.

Slowly increase the speed of the engine until the voltmeter needle "flicks" and then steadies. Note this value and stop the engine.

If this value lies outside the limits given in paragraph 2(b), the regulator setting must be adjusted.

If the value is within the limits, examine the cut-out as described in paragraph 3(c).

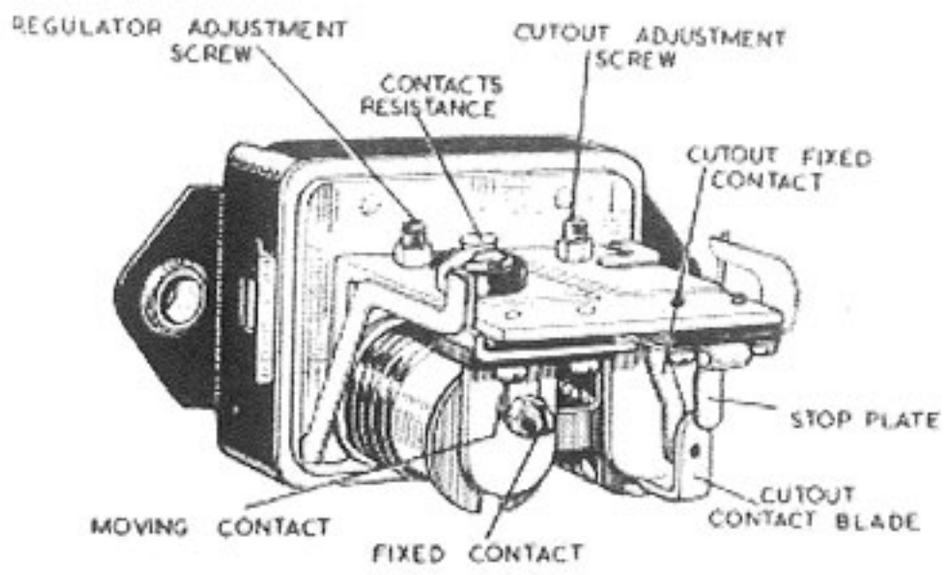


Fig. 2

(e) Adjusting the electrical setting of the regulator

Adjustment of the regulator requires removal of the control box cover. This is facilitated by removing the control box from the machine and providing temporary connections. Loosen the control box cover securing clips by slackening the securing screws set in the base of the control box, and lift off the cover.

It is important that regulator adjustments are carried out with the control box supported in a similar position to that on the machine.

Restart the engine.

Slacken the locknut of the regulator adjusting screw (see Fig. 2) and turn the screw in a clockwise direction to raise the setting or an anti-clockwise direction to lower the setting. Turn the screw only a fraction of a turn at a time and then tighten the locknut. Repeat as above until the correct setting is obtained.

Adjustment of regulator open-circuit voltage should be completed within 30 seconds; otherwise heating of the shunt winding will cause false settings to be made.

Stop the engine.

Remake the original connections and replace the cover. Ensure that the cover seats correctly on the sealing washer.

N.B.-A dynamo run at high speed on open circuit will build up a high voltage. Therefore, when adjusting the regulator, do not run the engine up to more than half throttle or a false setting will be made.

(d) Checking the electrical setting of the cutout

If the regulator is correctly set but the battery is still not being charged, the cut-out may be out of adjustment.

Replace the control box in the testing position, remake the temporary connections and remove the control box cover. Connect a voltmeter between terminals "D" and "E."

Start the engine and slowly increase the speed until the cut-out contacts close. Note the voltage at which this occurs and stop the engine. This should be 6.3-6.7 volts. If operation of the cut-out takes place outside these limits, it will be necessary to adjust.

(e) Adjusting the electrical setting of the cutout

Restart the engine.

Slacken the locknut securing the cut-out adjusting screw and turn the adjusting screw in a clockwise direction to raise the voltage setting or in an anti-clockwise direction to reduce the setting.

Turn the screw only a fraction of a turn at a time and then tighten the locknut. Test after each adjustment by increasing the engine speed and noting the voltmeter reading at the instant of contact closure.

Stop the engine.

Electrical setting of the cut-out, like the regulator, must be made as quickly as possible because of temperature-rise effects. Tighten the locknut after making the adjustment.

N.B.-if the cut-out does not operate, there may be an open-circuit in the wiring of the cut-out and regulator unit, in which case the unit should be removed for examination or replacement.

Battery Model PUZ7E

1. General

The model PUZ7E (see Fig. 1) is a "drycharged" 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.

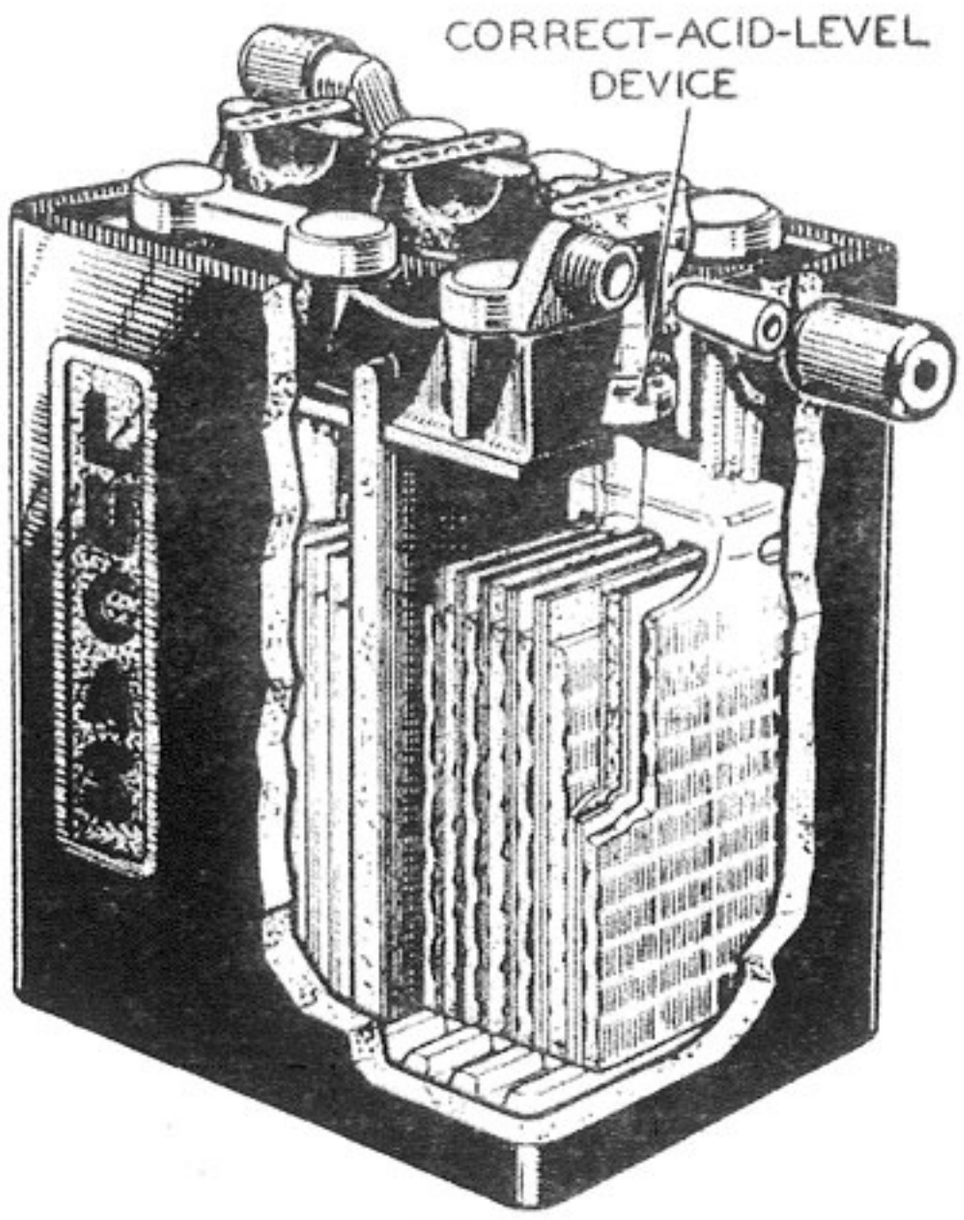


Fig. 1

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

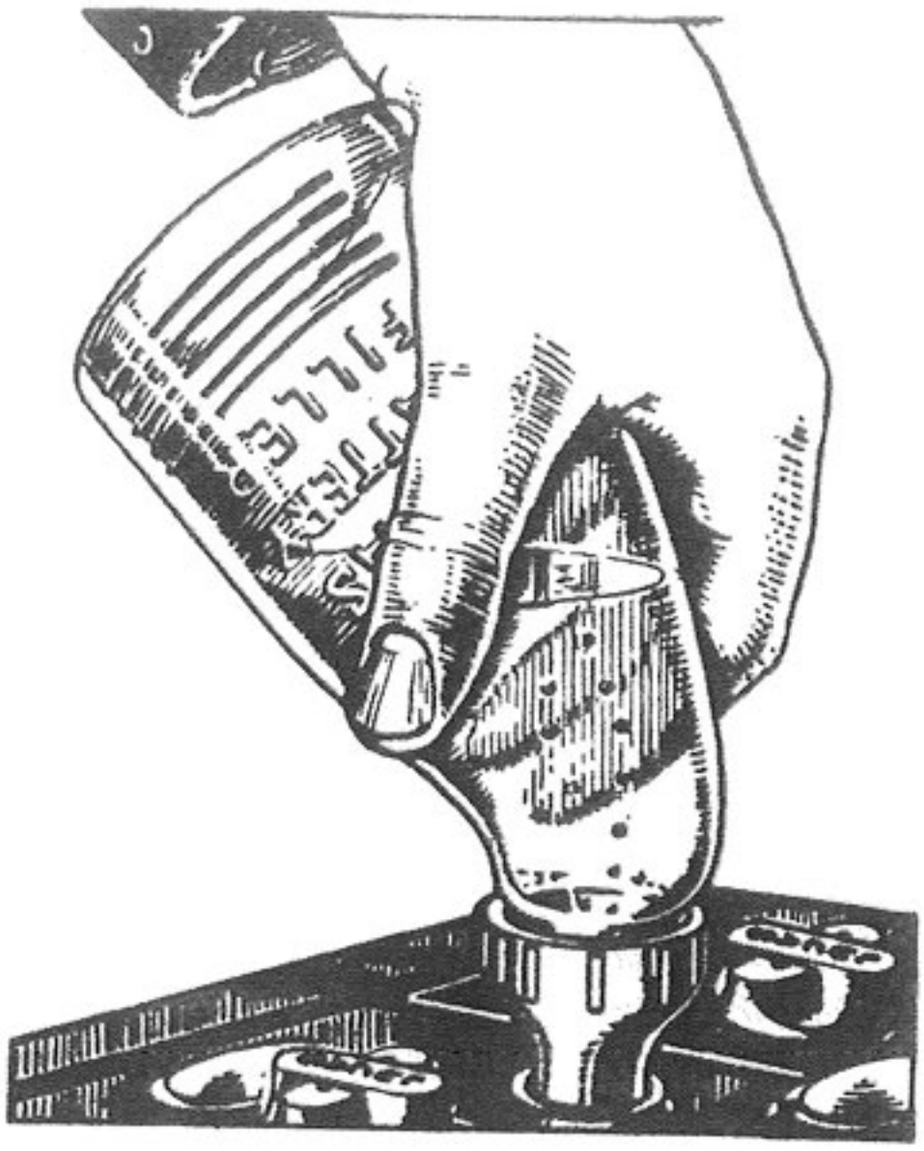


Fig. 2

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.

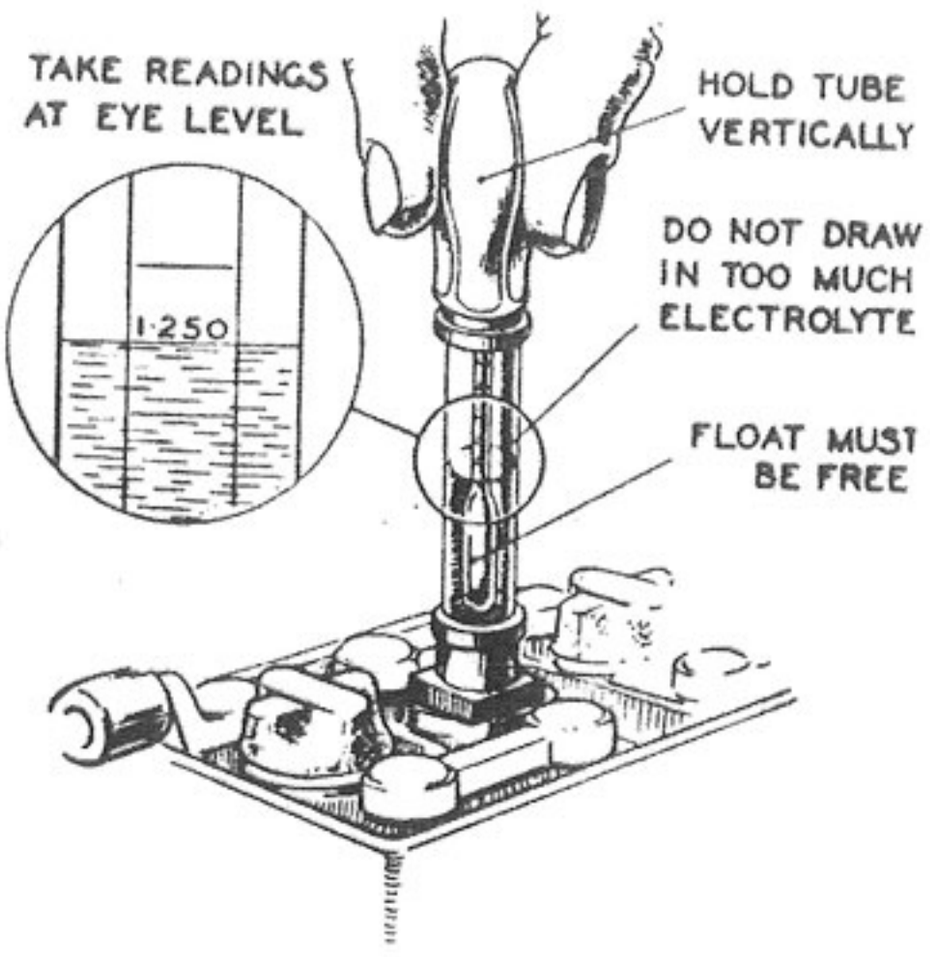


Fig. 3

SECTION G5a

Head and Tail Lamps

Used on Models G, J2, " 350 Bullet," " 500 Bullet," " 500 Twin," "Meteor 700," 1950 onwards

1. Headlamp

In all the above Models the headlamp incorporates the Lucas Light Unit MCF700. This is either fitted into a lamp shell (see Figs. 1 and 2) carried on brackets in front of the facia panel type of fork head and housing a switch, ammeter and parking lamp, or, on later models, is built into the Casquette fork head which contains twin parking lamps as well as the ammeter and switch. On machines fitted with coil ignition the ammeter has a red central window with the ignition warning light beneath.

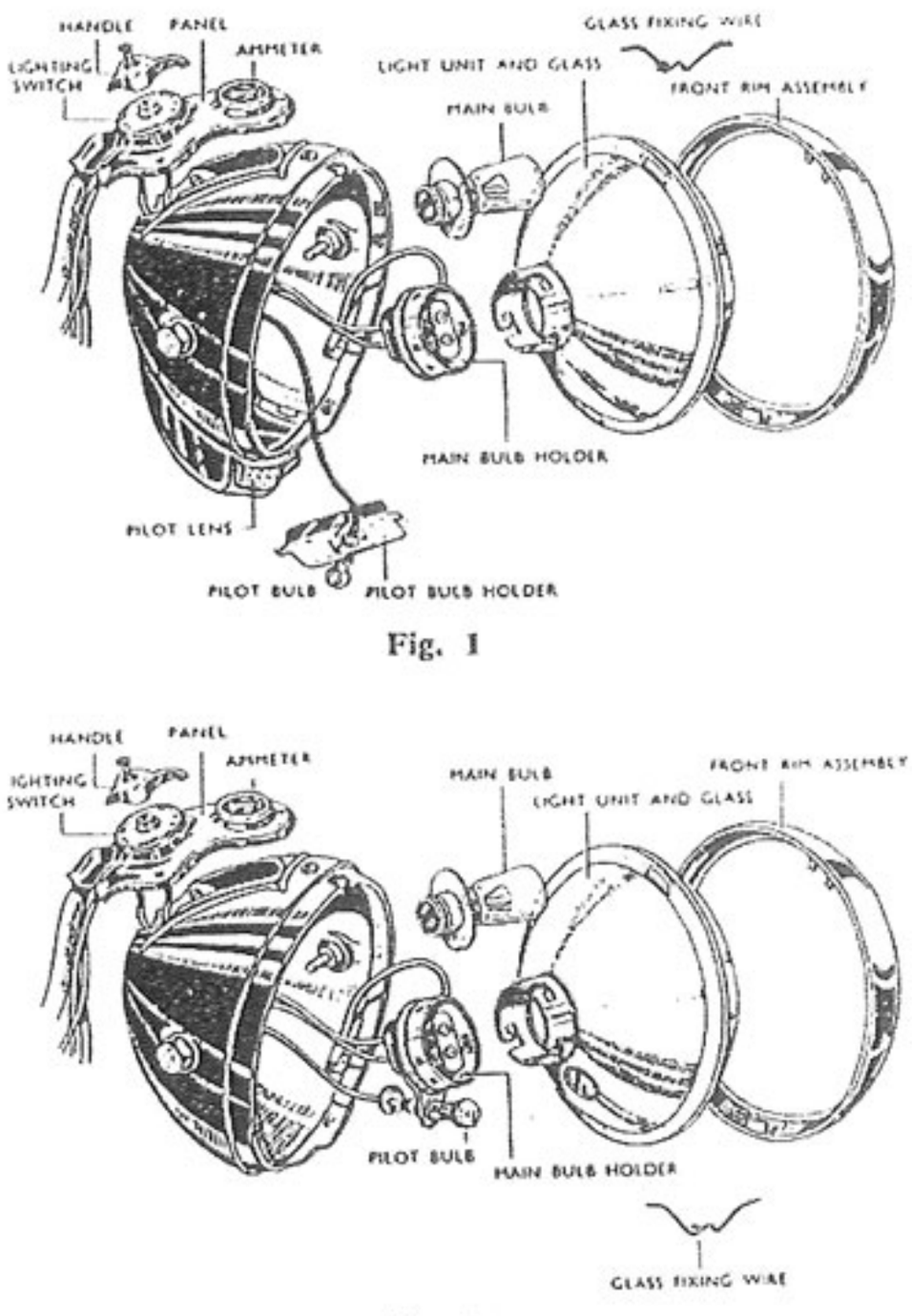


Fig. 1

Fig. 2

2. Lucas Light Unit

The unit incorporates a combined reflector and front lens assembly (see Fig. 3). 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.

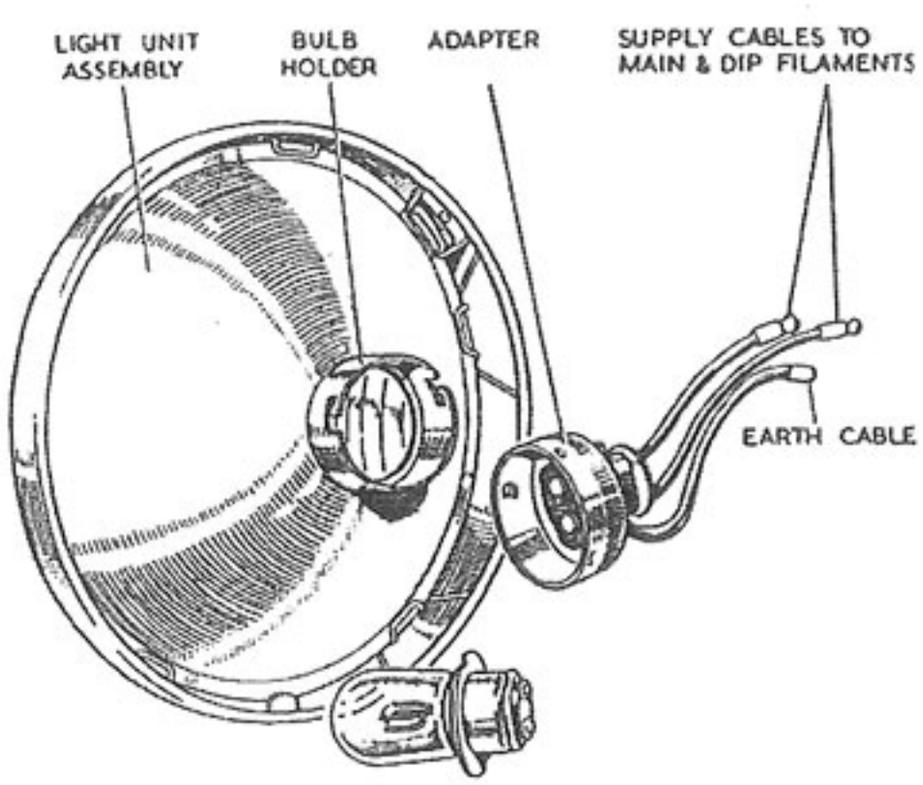


Fig. 3

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, 6v. 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

In the case of lamps having separate shells the parking bulb may be mounted either to show through a hole in the back of the main reflector (Fig. 1) or may be mounted in a separate housing beneath the lamp shell (Fig. 2). In the case of lamps fitted into a Casquette fork head twin parking lights are provided. In all cases the bulb is the same, i.e. 6v. 3 watt M.B.C. Lucas Part No. 988.

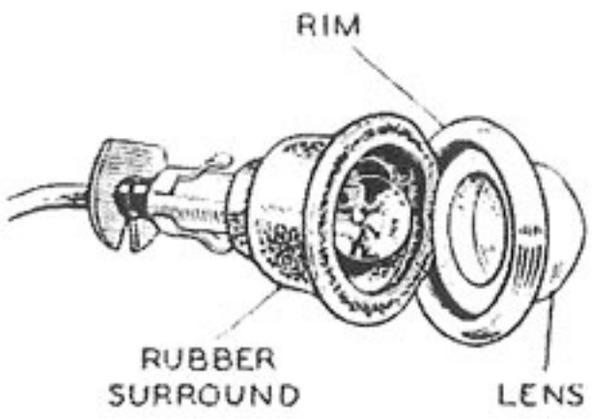


Fig. 4

Access to the parking bulb in the case of lamps with separate shells is obtained by removing the light unit as described in Subsection 2. In the case of lamps in which the parking bulb shows through a hole in the main reflector the bulb holder assembly should be removed. This will come away bringing with it the parking bulb which will then be readily accessible.

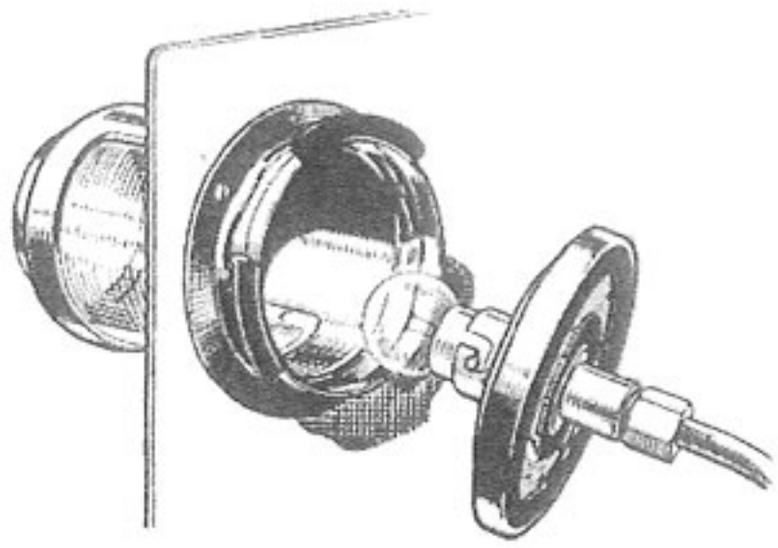


Fig. 5

In the case of lamps having the underslung parking light the parking bulb holder can be lifted out of the lamp shell after removal of the light unit.

In the case of lamps fitted into Casquette fork heads access to the parking bulbs is obtained by removing the parking lamp rim (see Fig. 4). This may merely be forced over the edge of the rubber lamp body or in the case of later machines is additionally secured by means of a small fixing 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

Earlier machines used a circular metal-bodied tail light, either Lucas No. MT110 (Fig. 5) or No. 480 (Fig. 6). In the former case, access to the bulb is obtained by removing the back of the lamp, which will come away bringing the bulb with it. In the latter case, the front of the lamp is removed, leaving the bulb carrier in position. In either case the bulb is the same, that originally fitted being 6 volt 3 watt S.B.C., Lucas Part No. 200, which, however, on machines of over 250 c.c. should now be replaced by 6 volt 6 watt S.B.C. Lucas No. 205.

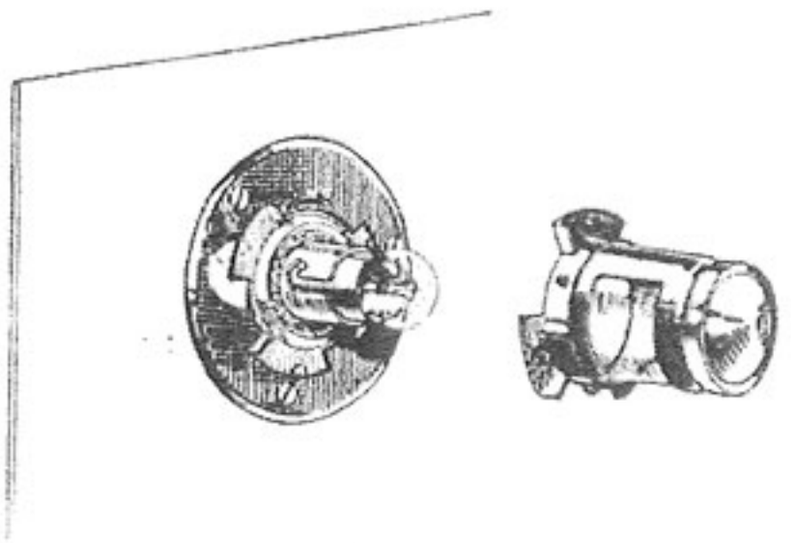


Fig. 6

Recent machines use lamps with red plastic covers, either Type 529 (Fig. 7), which is a tail lamp only; 525 (Fig. 8), which is a combined stop and tail lamp; or 564 (Fig. 9), which is a combined stop and tail lamp and reflector.

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

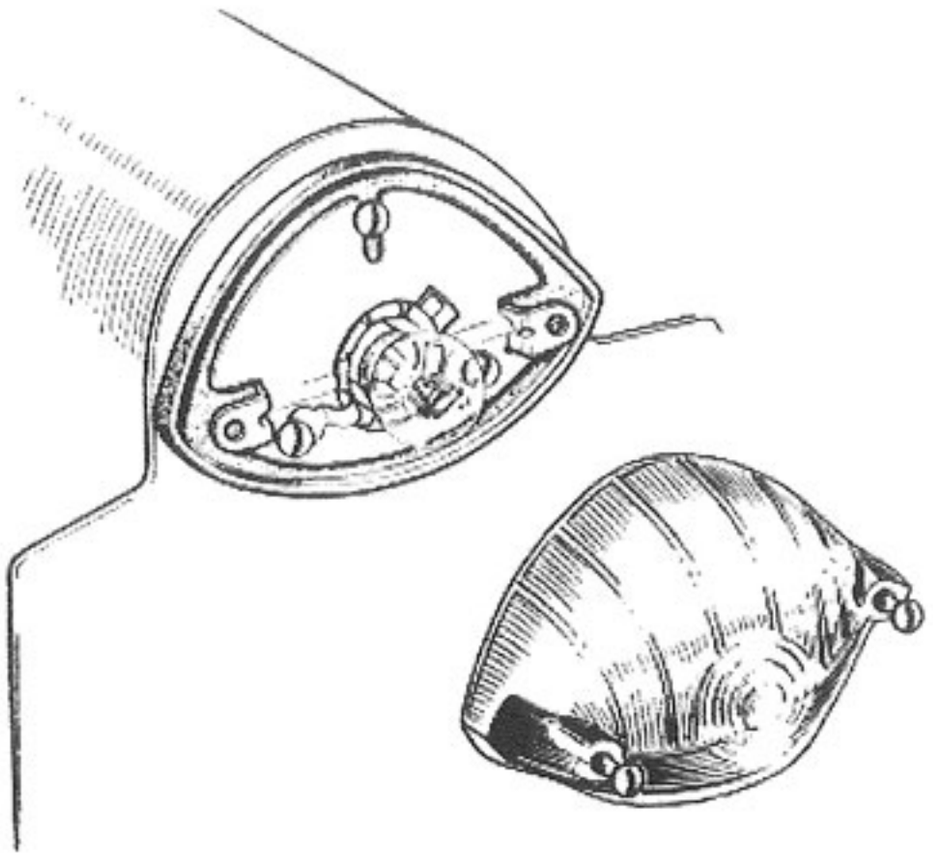


Fig. 7

The correct bulb for the 529 lamp is either Lucas No. 988 6volt 3 watt M.B.C. or No. 951 6volt 6 watt M.B.C.

The correct bulb for the stop tail lights 525 and 564 is either Lucas No. 352 6volt 3/18 watt or Lucas No. 384 6volt 6/18 watt. The 3 watt or 6 watt filament provides the normal tail light, while the 18 watt filament is illuminated on movement of the brake pedal.

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

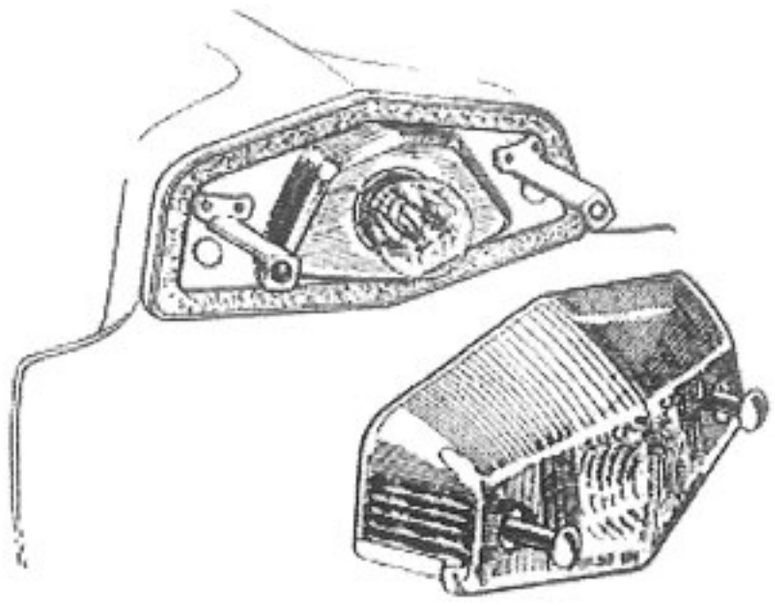


Fig. 8

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 3 or 6 watt filament, if used as a stop-tail light will be ineffective in bright sunlight.

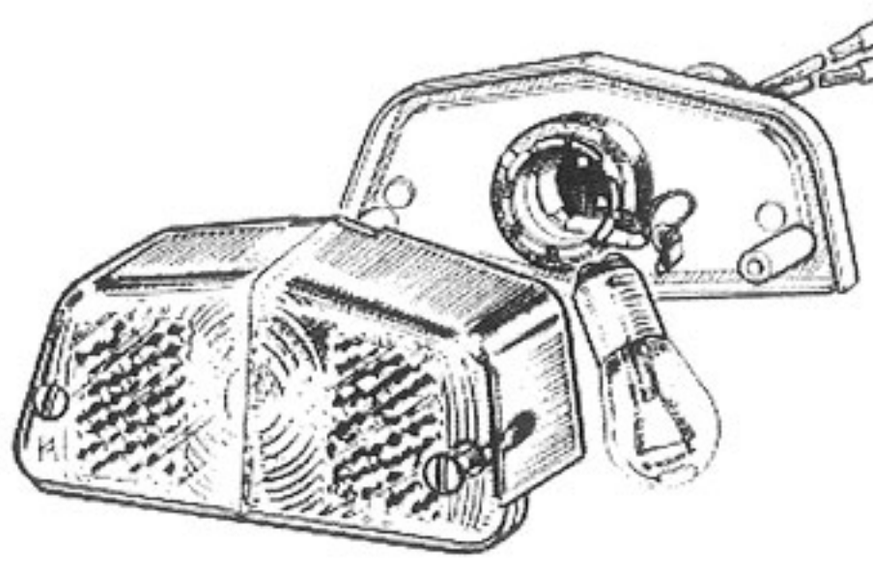


Fig. 9

Royal Enfield

Motor Cycle Prices

1954 SEASON

SPRING FRAME MODELS	Retail Price £ s. d.	Purchase Tax £ s. d.	Total £ s. d.
"Ensign" 148 c.c. Two stroke ...	78 0 0	15 12 0	93 12 0
"250 Clipper" 248 c.c. O.H.V. ...	135 0 0	27 0 0	162 0 0
"350 Bullet" 346 c.c. O.H.V. ...	155 0 0	31 0 0	186 0 0
"500 Bullet" 499 c.c. O.H.V. ...	170 0 0	34 0 0	204 0 0
"500 Twin" 496 c.c. O.H.V. ...	185 0 0	37 0 0	222 0 0
"Meteor 700" 692 c.c. O.H.V. ...	195 0 0	39 0 0	234 0 0

STANDARD MODELS	£ s. d.	£ s. d.	£ s. d.
Model S. 248 c.c. O.H.V. ...	115 0 0	23 0 0	138 0 0
Model G. 346 c.c. O.H.V. ...	135 0 0	27 0 0	162 0 0
Model J.2. 499 c.c. O.H.V. ...	145 0 0	29 0 0	174 0 0

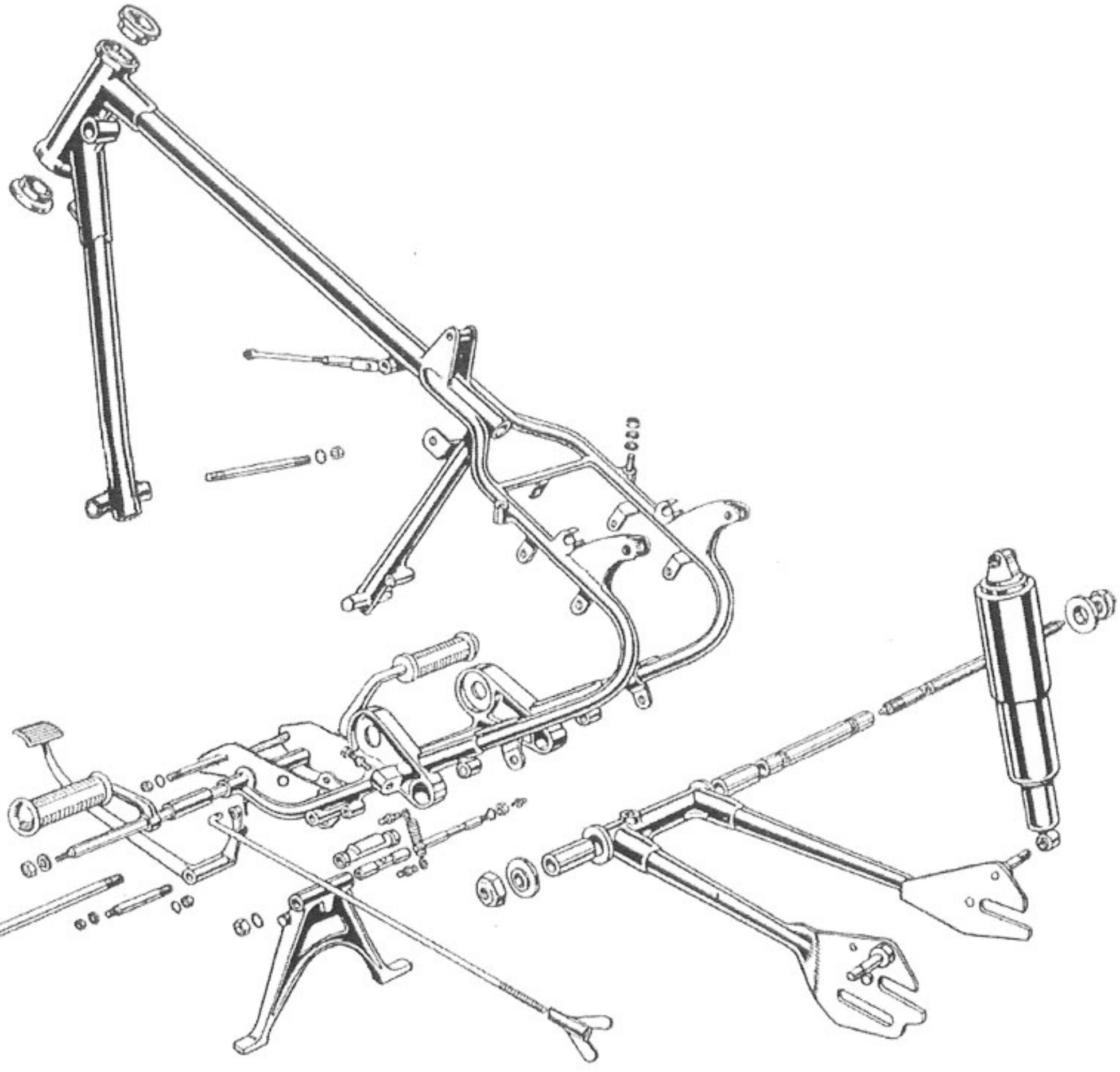
SPECIAL COMPETITION MODELS	£ s. d.	£ s. d.	£ s. d.
"350 Bullet" - Trials & Scrambler	160 0 0	32 0 0	192 0 0
"350 Bullet" - Short Circuit Racer	175 0 0	35 0 0	210 0 0
"500 Buller" - Trials & Scrambler	175 0 0	35 0 0	210 0 0
"500 Buller" - Short Circuit Racer	190 0 0	38 0 0	228 0 0

EXTRA EQUIPMENT	£ s. d.	£ s. d.	£ s. d.
Legshields ("Ensign")	1 17 6	*	1 17 6
Pillion Seat and Footrests ("Ensign") ...	4 19 6	*	1 19 6
Legshields (Other Models)	1 19 6	*	1 19 6
Dual Seat on O.H.V. Models	3 10 0	14 0	4 4 0
Pannier Set on Spring Frame Models	5 10 0	1 2 0	6 12 0
Dual Front Brake on "350 Bullet," "500 Buller," and "500 Twin" Models	5 0 0	1 0 0	6 0 0
Sidecar Forks, Gear and Steering Damper on Model J.2., "500 Bullet" and "Meteor 700"	1 17 6	7 6	2 5 0
Magdyno, Lighting Set on Trials Models ...	8 10 0	1 14 0	10 4 0

1st November, 1953 *Tax Free—Supplied separately.

SECTION H1

FRAME



EXPLODED VIEW OF LATE 1954-1956 500 TWIN AND 1954-1955 700 METEOR FRAME

1. Description of Frame

The frames used on the above models are basically identical, with swinging arm rear suspension, but there are some small differences in the lugs for engine attachment, the method of attachment of the pivot point for the swinging arm and in the width between the brackets supporting the upper ends of the rear suspension units. For part numbers of frames see appropriate spares lists.

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 chromemolybdenum 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 provided 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.

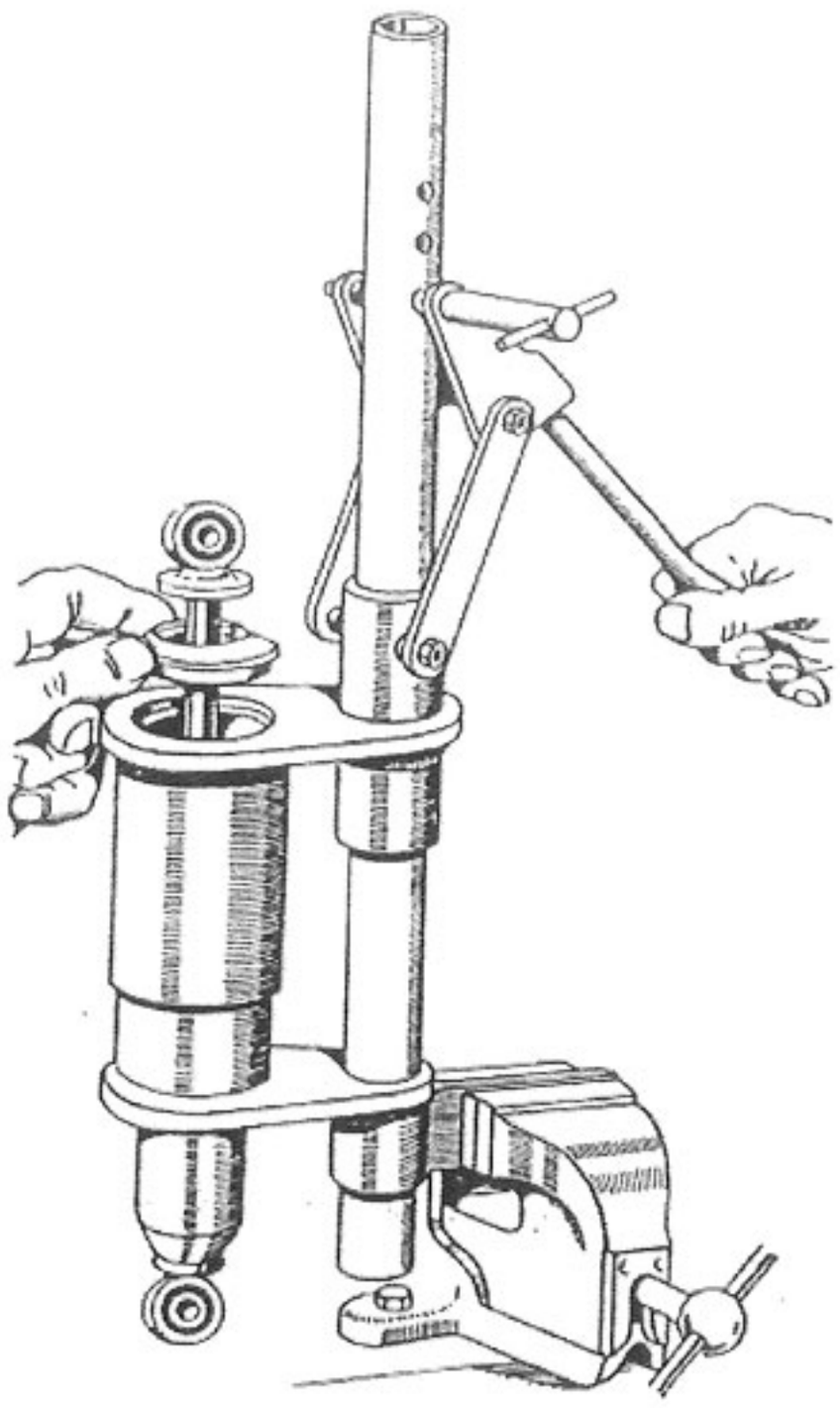
3. Removal of Rear Suspension Unit

The rear suspension units are readily removed by undoing the top pivot pin nut, driving out the pivot pin, then hinging the suspension unit back on the lower pivot pin, removing the lower nut and pushing the suspension unit off the pivot pin welded to the fork end.

4. Servicing Rear Suspension Units

(a) Proprietary Units. The proprietary units fitted to most 1954 and all 1955 models 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.

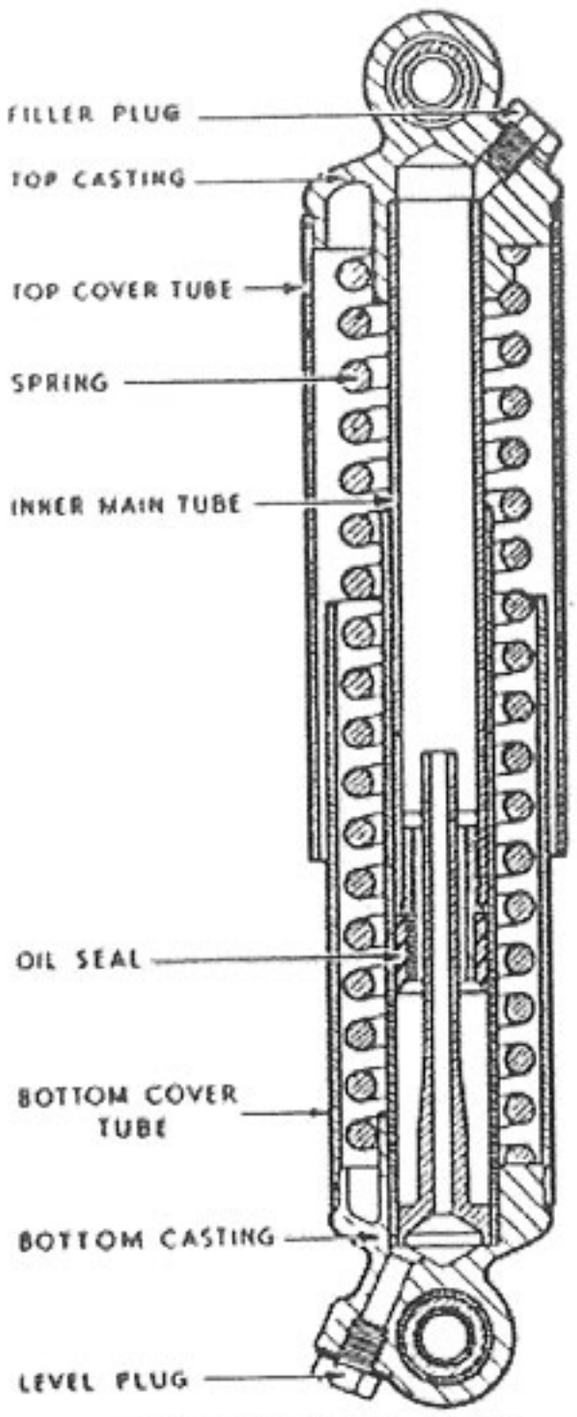


REAR SPRING COMPRESSOR
Fig. 2

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

(b) Royal Enfield Units. Mark 1. Enfield rear suspension units, Part Number 34276 or 36451, are shown in Fig. 3. Units having Part No. 34276 are fitted with springs of .252 in. diameter wire (Part No. 34284) having a rating of approximately 200lb per inch (when fitted on

the scrolls). Units having Part No. 36451 have a spring of .264in. diameter wire (Part No. 35494) having a rating of approximately 250lb. per inch. The free overall length of both types of spring is 7.3/4 in. New springs should be fitted if they have set more than 1/8 in.



ROYAL ENFIELD UNIT MARK I
Fig. 3

This type of suspension unit was fitted on "350 Bullet" and "500 Twin" Models up to the early part of the 1954 season, and on the "250 Clipper" Model up to the later part of the 1954 season.

To dismantle the unit, remove it from the machine, grip the lower end of the bottom casting in a vice, unscrew the top cover tube, place a suitable bar through the Silentbloc bush in the top casting and turn so as to unscrew the spring from the scroll on either the top or bottom casting.

The top casting with the inner main tube (which is brazed into it) and the oil seal can now be withdrawn from the outer main tube and bottom casting. If the spring has remained attached to the bottom casting, unscrew the bottom cover tube and unscrew the spring from the scroll on the bottom casting, if necessary tapping it with a hammer and a blunt chisel. The outer main tube is brazed into the bottom casting and the hollow damper post is brazed into the main tube.

Oil tightness of these units depends on the condition of the edge of the oil seal which must be handled with great care. The synthetic rubber seal is bonded to a hollow metal plug which forms the valve port in the hydraulic damping system. If the oil seal needs renewing the easiest way to remove it from the inner main tube is to pass a 13/32 in. diameter bar through the hollow plug to prevent it closing in, then grip the oil seal in a vice, pass a bar through the eye in the top casting and pull and twist to withdraw the hollow metal plug from the end of the main tube. Take care not to damage the new seal when fitting it.

After reassembling, remove the oil filler and level plugs and fill with one of the following oil, until it runs out through the level plug orifice:

Castrolite; Vacuum Arctic ;
Shell X-100. 20/20w; Essolube 20;
B.P. Energol S.A.E. 20.

Wait till the oil has ceased running, then replace the oil filler and level plugs.

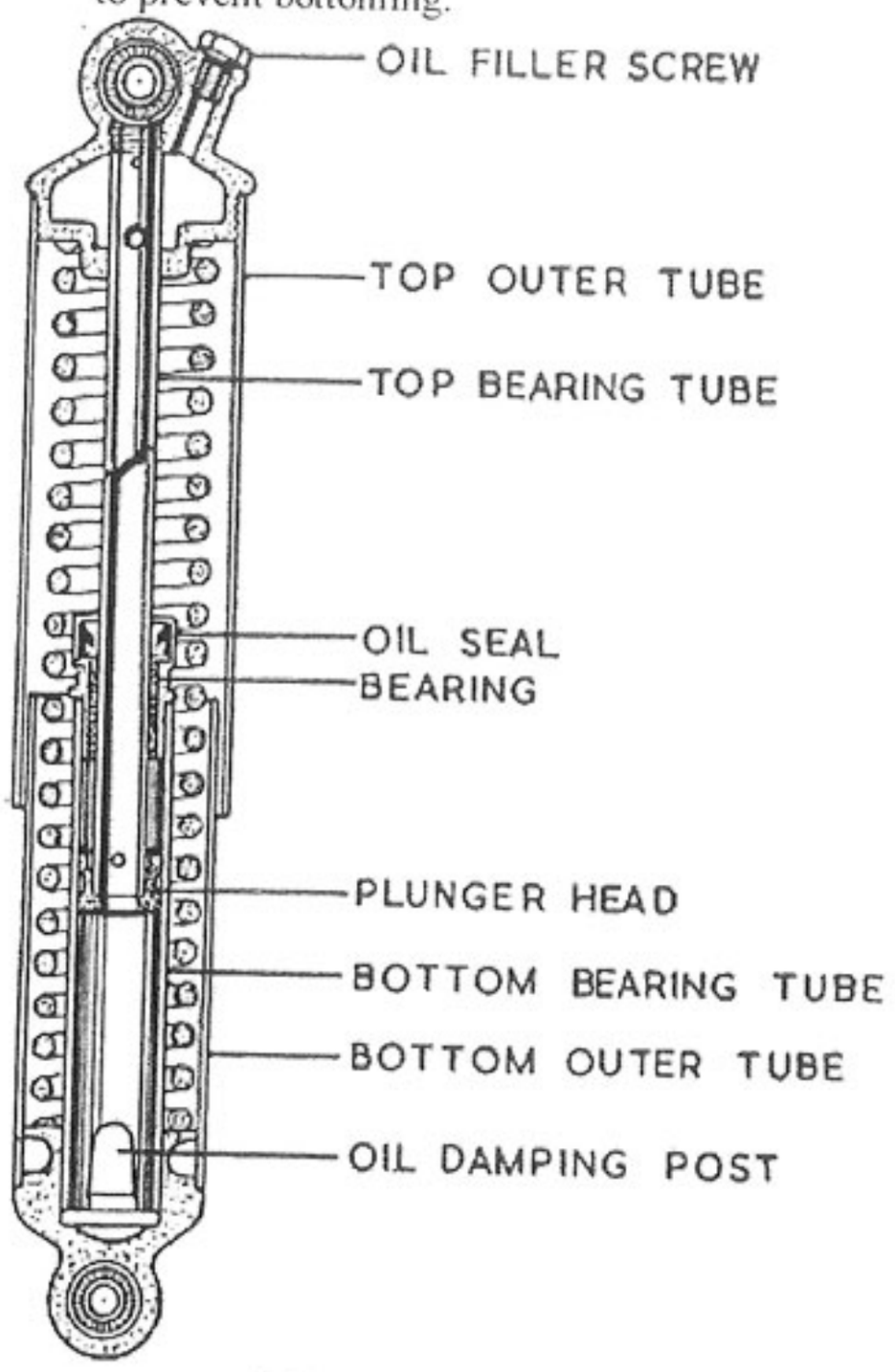
(c) Royal Enfield Units. Mark II. Enfield rear suspension units, Part No. 38109, are shown in Fig. 4. This type provides positive damping on the rebound stroke and in consequence does not need the spring to be anchored on scrolls. The range of movement is greater than the Mark I dampers and on account of this and the improved damping the ride is better, particularly on extended rough sections. The spring rate is 150 lb. per inch.

This type of unit was fitted on the "Meteor 700" model up to the early part of the 1954 season and on the "500 Bullet" model up to the later part of the 1954 season.

The Plunger Head contains a disc valve which on the bump stroke provides only a slight restriction to passage of oil between the inside of the bottom bearing tube and the damper chamber which is bounded by the inside wall of the upper end of the bottom bearing tube, the outer wall of the lower end of the top bearing tube, the upper surface of the plunger head and the lower end of the bearing bush. Since there is not room in the damper chamber for all the oil displaced on the bump stroke, provision is made for the surplus to pass up the inside of the top bearing tube and into the hollow top end casting.

On the rebound stroke the disc valve in the plunger head closes under pressure in the damper chamber, so that the oil is forced past the clearance between the plunger head and the inside wall of the bottom bearing tube, thus providing positive damping on the rebound stroke.

At the end of the bump stroke the Oil Damping Post enters the open end of the top bearing tube thus providing a hydraulic cushion to prevent bottoming.



ROYAL ENFIELD UNIT
MARK II
Fig. 4.

To dismantle the unit, remove it from the machine, grip the lower end of the bottom casting in a vice and unscrew the top outer tube. Now insert a thin spanner .820 in. across flats between the coils of the spring to engage the flats on the top bearing and oil seal assembly, unscrew this and withdraw the top casting, top bearing tube and plunger head from the bottom bearing tube, bottom casting and outer tube assembly.

The spring can now be lifted away. Its original free length is 8.3/4 in. If it has closed more than 1/8 – 3/16 in. a new spring should be fitted.

If it is required to renew the bearing bush or oil seal, the plunger head must be dismantled by unscrewing it from the top bearing tube and then lifting away the Oil Control Valve and circlip, the top bearing assembly comprising the oil seal and bearing bush in a housing can now be withdrawn from the lower end of the top bearing tube. The oil seal and bearing bush are secured in the housing by spinning over the end of the latter. A new assembly must therefore be fitted if either oil seal or bearing require renewing.

After reassembly of the plunger head, fill the bottom bearing tube with oil of one of the grades given below. Remove the oil filler screw from the top casting, replace the spring, and carefully insert the plunger head into the bottom bearing tube, pushing it down slowly so as to spill as little oil as possible and allow time for oil to enter the damper chamber and pass up the inside of the top bearing tube. Tighten down the top bearing and oil seal assembly with a thin spanner inserted between the coils of the spring.

Now use a mandrel press or a vertical drilling machine to compress the damper unit fully and carefully insert oil through the filling orifice until the unit is completely full. Slightly release the pressure and then compress again fully several times to remove air bubbles. Release the pressure to allow the spring to expand about 1 in. before replacing the oil filler plug.

Use one of the following grades of oil:
Castrolite; Vacuum Arctic;
Shell X-I00 20/20w; Essolube 20;
B.P. Energol S.A.E. 20.

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.

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. Note that the position of the stand when raised is controlled by the stop on the rear engine plate spacer, Part No. 35060. This should be adjusted so that the stand is as high as possible without actually hitting the exhaust pipe.

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.

SECTION J1

Front Fork

With Casquette and Aluminium Alloy Bottom Tubes

1. Description

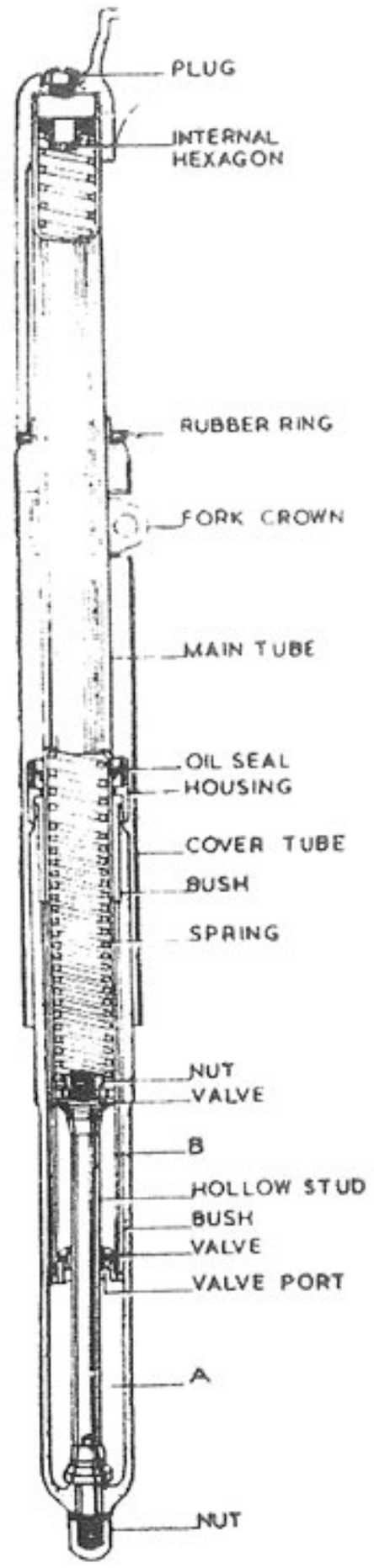
The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is screwed into the Casquette fork head at the upper end and securely clamped to the fork crown. Fitted over the lower end of the main tube is the bottom tube made of high strength 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 mean, 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.

A special fork is available for sidecar machines. This has bottom tubes with extended wheel lugs giving less trail and is fitted with stronger springs and a steering damper.

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 fork spring so that the damper chamber "B" is always kept full of oil.



SECTION OF FORK LEG

Fig. 1

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." 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.

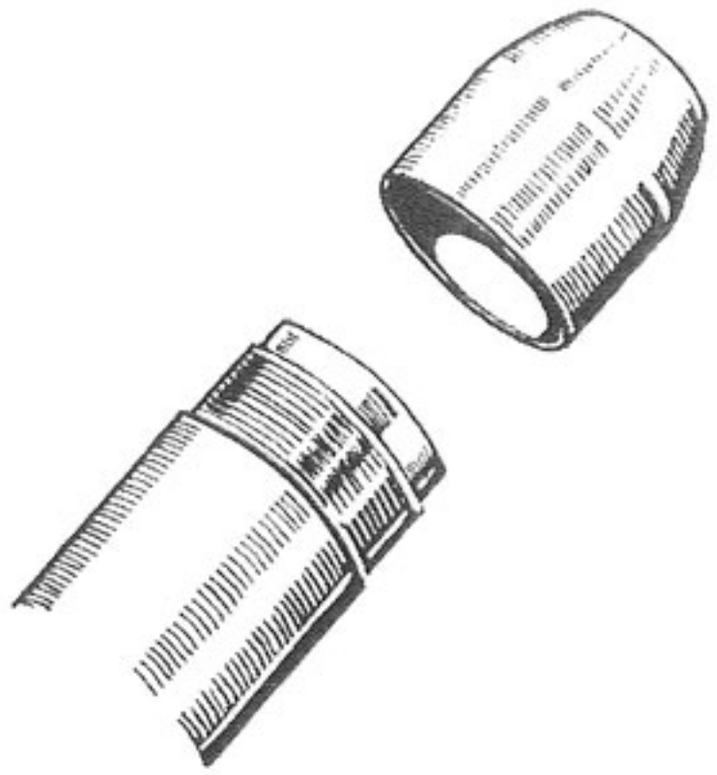
On the rebound stroke the oil in the damper chamber "B" is forced through the annular space between the spring stud and the bore of the main tube valve port. During this stroke pressure in chamber "B" closes the two disc valves at the upper and lower ends of the chamber so that the only path through 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. Unscrew the bottom spring stud nut (38080) which will allow oil to run out of the fork down to the level of the cross hole in the spring stud. Now knock the spring stud upward into the fork with a soft mallet, thus allowing the remainder of the oil to escape. Pull the fork bottom tube down as far as possible, thus exposing the oil seal housing (38157). Unscrew this housing either by mean of a spanner on the flats with which it is provided or by using the gland nut handgrips (E.5417). 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.



MAIN TUBE SEAL GUIDE

Fig. 3

Now unscrew the main tube valve port using "C" spanner (E5418). 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

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 housingafter 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 .500 in. across flats (Unbrako wrench W. 11) or the special tool shown in Fig. 2.

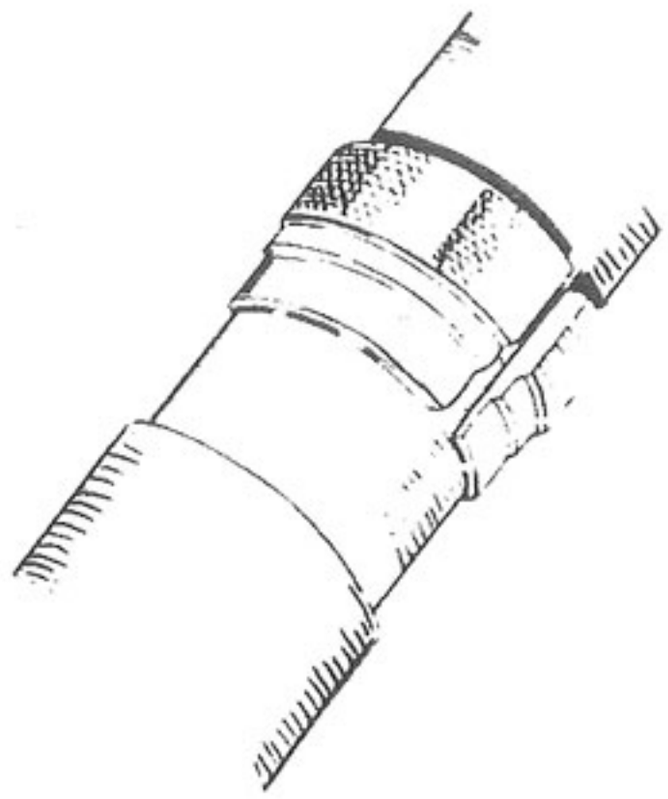
4. Spring

Solo and Sidecar springs are available. The free length of each is 20.1/2 ins. The spring should be replaced if it has closed by more than 1 inch.

5. Reassembly of Parts

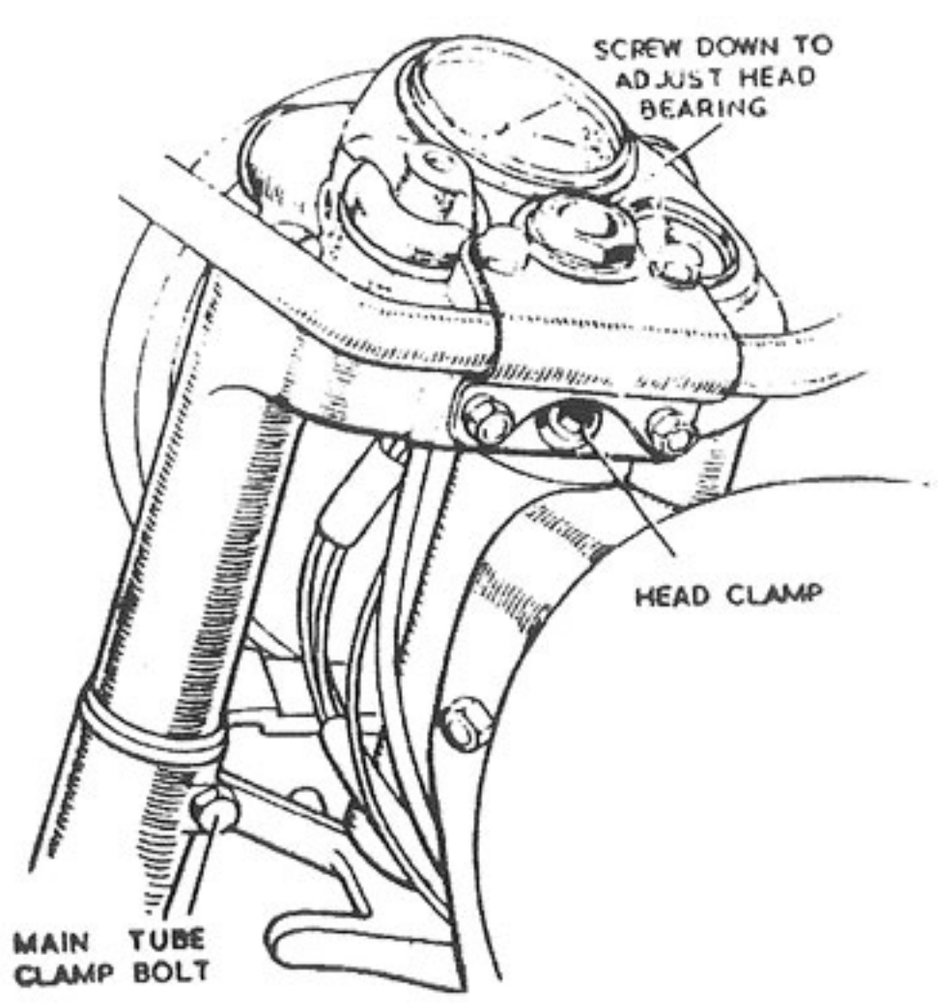
When refitting the oil seal, or fitting a new one, great care must be exercised not to damage the synthetic rubber lip which forms the actual seal. If the seal has been removed from the upper end of the main tube and is refitted from this end a special nose piece (Fig. 3) must be fitted over the end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



OUTER COVER CENTRALISING BUSHES

Fig. 5



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 1/4 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 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 (LU/365408) in the fork head.

Disconnect the speedometer drive from the speedometer head and unscrew the steering damper knob and rod (if fitted) after removal of the split pin through the lower end of the rod. Undo the steering damper anchor plate pin so as to disconnect the damper from the frame of the machine.

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 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 7.1/2 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.

9. Air Vents

The earlier forks of this type were provided with holes at the upper end of each main tube communicating with small vent holes in the Casquette head. Experience has shown that on rough roads oil may escape through these air vents which in consequence are now omitted. Escape of oil from the earlier forks can be largely eliminated by fitting specially long plug screws, which are available. The Part Number is 40118. If these are fitted and the final vent hole is stopped up with a wooden plug leakage at this point is impossible. Fitting the special plug screws alone is sufficient in most instances.

SECTION J3

Front Fork

With Facia Panel and Aluminium Alloy Bottom Tubes

Used on " 500 Bullet," 1953 ; "Meteor 700," 1953

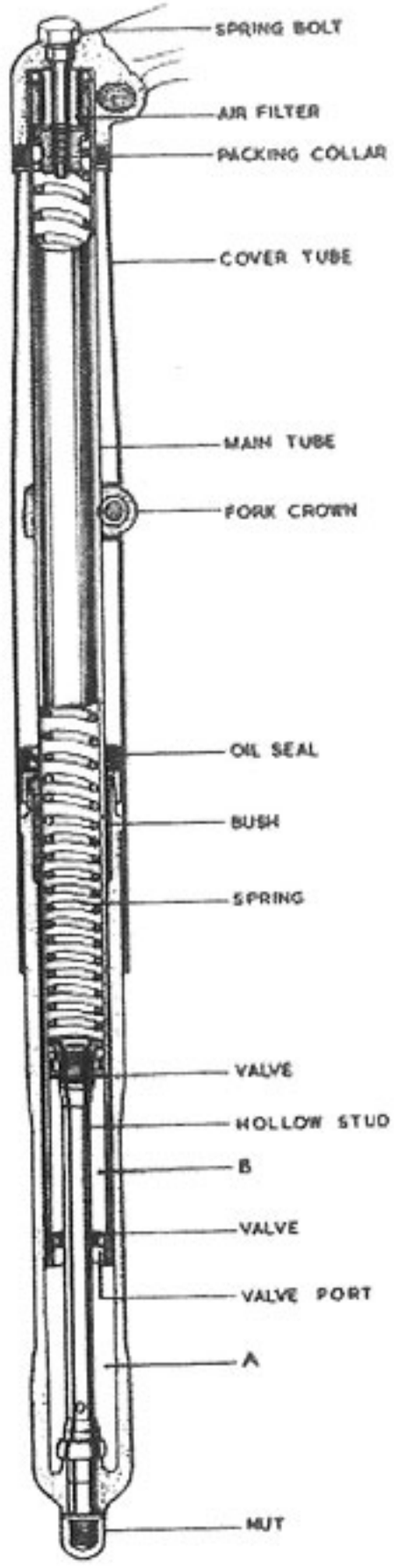
1. Description

The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is securely clamped to the Facia Panel Fork Head and 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 main tube and upper end of the bottom tube are protected by a one-piece cover secured to the fork crown and carrying a pressed steel lamp bracket welded to it.

A special version of the fork is available for sidecar use. This has a modified fork head and fork crown setting the main tubes 1.1/2 in. further forward thus giving less trail and providing lighter steering when used with a sidecar. These sidecar forks also are fitted with a steering damper and have stronger springs.

2. Operation of 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.



SECTION OF LEG

Fig. 1

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." 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.

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. Unscrew the bottom spring stud nut (38080) which will allow oil to run out of the fork down to the level of the cross hole in the spring stud. Now knock the spring stud upwards into the fork with a soft mallet, thus allowing the remainder of the oil to escape. 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 (E4912). 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.

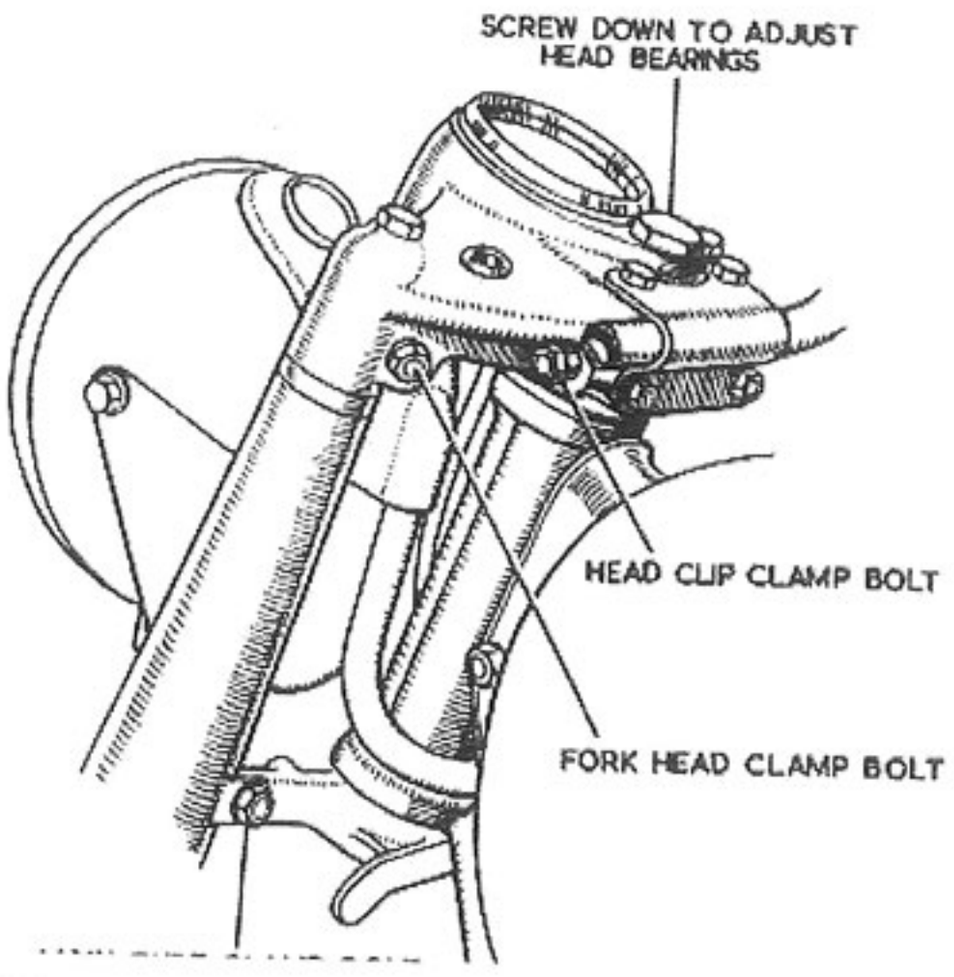
Now unscrew the main tube valve port using "C" spanner (E5418). The spring stud and spring can now be withdrawn from the lower end of the main tube.

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 from the upper end after removal of the main tube from the fork head and fork crown, as described in paragraphs 6 and 7.

4. Spring

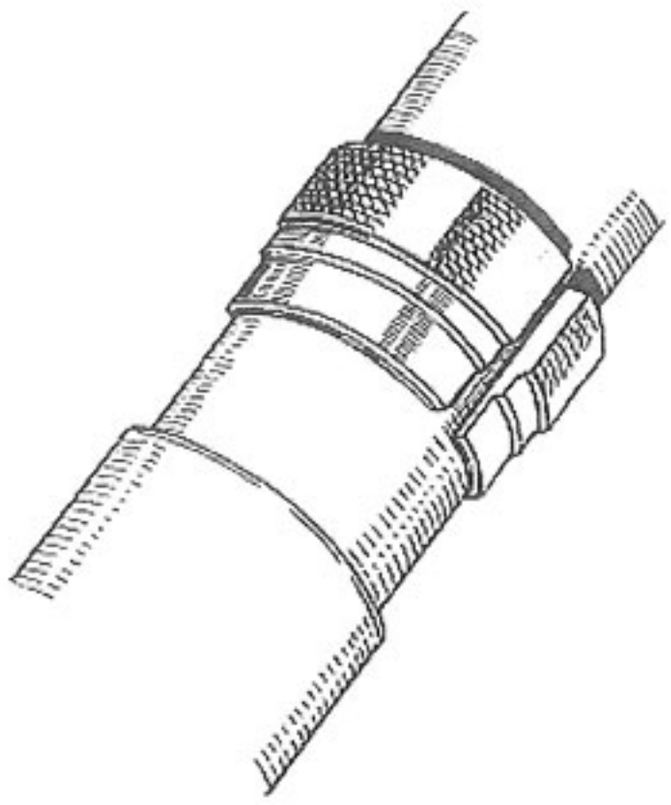
Solo and sidecar springs are available. The free length of each is 20.1/2 in. The spring should be replaced if it has closed by more than 1 inch.



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

5. Steering Head Races

The steering head bearing consists of two deep groove thrust races each containing nineteen 1/4 in. diameter balls. The bearing is adjusted by tightening the steering stem locknut after loosening the nuts on the three pinch bolts which secure the fork head to the steering stem and to the two main tubes. The head should be adjusted so 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.



OUTER COVER CENTRALISING BUSHES

Fig. 3

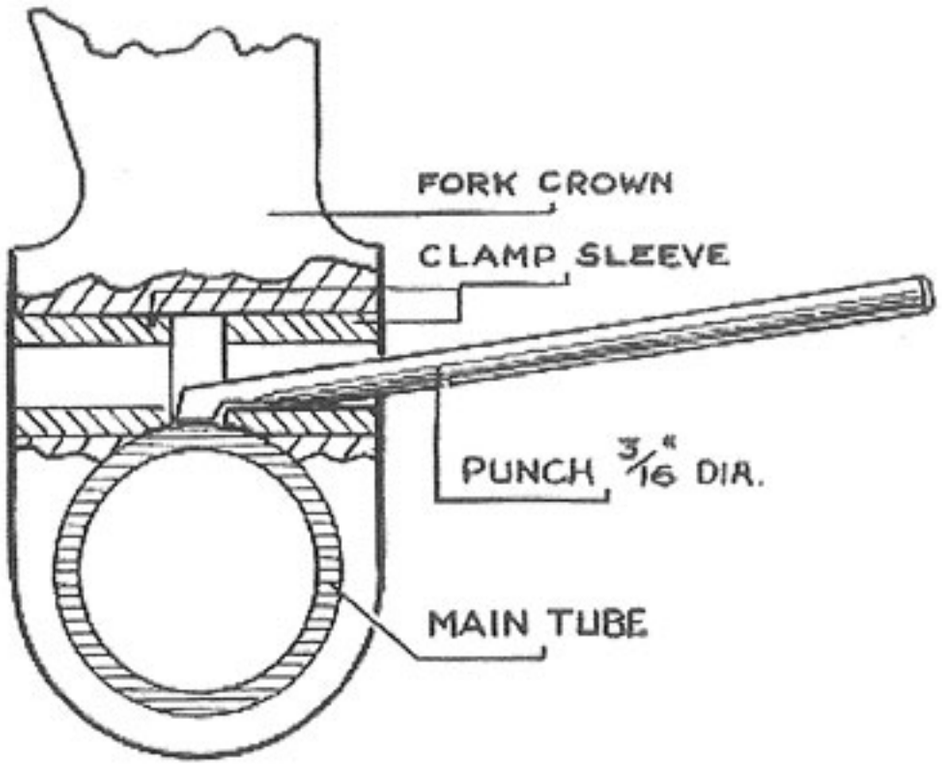
Adjustment of the steering head depends on the ability of the fork head to slide on the steering stem and on the fork main tubes. A rubber washer is interposed between the fork head and the top of the lamp bracket tube to permit the necessary movement. If this rubber washer is fully compressed while there is still some play in the steering head it will be necessary to remove the fork head (see paragraph 6) and shorten the lamp bracket tube by, say, 1/32 in. Alternatively, if the lamp bracket tube is loose when the steering head is correctly adjusted, it can be tightened by fitting an additional steel washer (Part No. 35974) beneath the rubber washer.

It is also possible that the steering head cannot be adjusted because the main tube is bottoming in the recess in the fork head in which it fits. In this case the nuts on the fork crown clamp stud, must be loosened and the sleeves separated (see paragraph 7) thus permitting the main tubes to slide through the fork crown. Do not forget to tighten the fork head pinch bolts and the nuts on the fork crown clamp studs after adjusting the steering head. 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 lower end of the cover tube. A pair of split bushes (Fig. 3) is useful to ensure centralisation of the cover tubes.

6. Removal of Facia Panel Fork Head, Spring, etc.

To remove the Facia Panel Fork Head for access to the lamp bracket tubes (or to change the fork spring without disturbing the bearings) proceed as follows-disconnect all control cables at the handlebar end and remove the headlamp from the lamp brackets. The switch panel can conveniently be removed from the back of the lamp so that the body of the lamp can be removed completely.

Now remove the two Fork Spring Guide Bolts from the fork head, unscrew the nuts on the fork head clip bolt and the two main tube clip bolts, remove the three clip bolt sleeves and knock out the three clip bolts. The facia panel fork head can now be tapped gently upwards with a hide mallet or a hammer and a wooden drift but care must be taken to hit only the more solid parts of the fork head, i.e. beneath the handlebar clip and at the back of the main tubes, avoiding the underside of the comparatively thin portion in front of the speedometer.



DRIFT FOR PARTING CLAMP SLEEVES

Fig. 4

After removal of the fork head the lamp bracket tubes can be lifted straight off and the springs can be withdrawn from the upper end of the main tubes.

7. Removal of Main Tubes

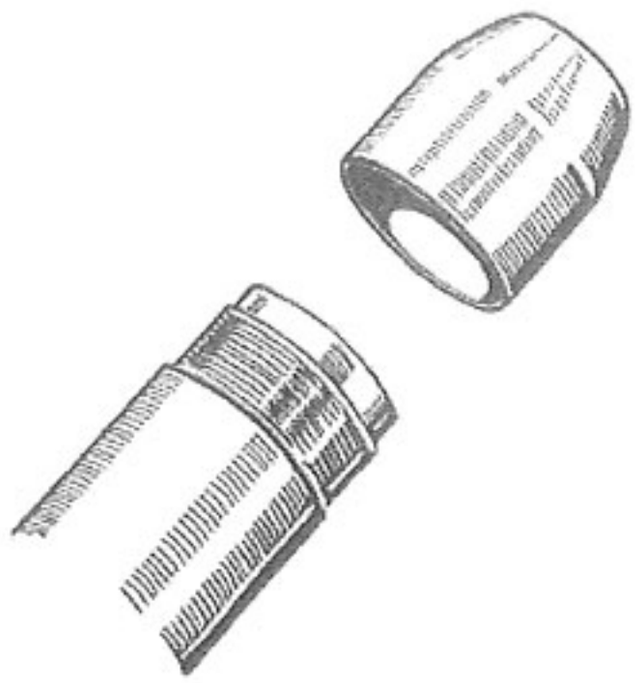
To remove the main tubes first dismantle the fork as described in paragraph 3 then remove the facia panel fork head and lamp bracket tubes as described in paragraph 6. Now remove one nut from each of the fork crown clamp studs, remove the studs and separate the clamp sleeves with a drift of the form shown in Fig. 4. Now knock the main tubes out of the fork crown either upwards or downwards as may be most convenient. If the machine has been in an accident and the tube is badly bent both above and below the fork crown, it may be necessary to cut through the tube with a hacksaw before it can be withdrawn.

8. Reassembly of Parts

No difficulty should be experienced with this. When refitting the main tube use the lamp bracket tube as a guide to its correct position in the fork crown. The small shoulder some 1.1/2 in. from the upper end of the tube should be 1/8 in. above the top of the lamp bracket tube when the latter is in position on the fork crown. With the main tube in this position tighten the fork crown clamp screws before fitting the facia panel fork head.

The cover tube must be fitted in position on the fork crown and the clamp sleeves placed in position before the main tube is fitted. To keep the clamp sleeves in position it is convenient to insert a short piece of tube or bar in the eye of the fork crown before putting the cover tube in position. The short piece of tube will be pushed out when inserting the main tube. Before tightening the nuts on the three fork head clip bolts make sure that the bolt heads and the sleeves are correctly positioned with the cut-away portion engaging the main tube or steering stem. Failure to do this may result in a cracked fork head.

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. 5) must be fitted over the end of the tube to prevent the thread from damaging the oil seal.



MAIN TUBE SEAL GUIDE

Fig. 5

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.

9. Lubrication

The lubrication of the fork bearings is elected 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 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 7.1/2 fluid ounces in each leg. Recommended grades of oil are Castolite, Mobiloil Arctic, Essolube 20, B.P. Energol S.A.E. 20 and Shell X-100 20/20 w.

SECTION J4
Front Fork

With Facia Panel and Steel Bottom Tubes
Used on "350 Model G," "500 Model J2," 1951 onward:
" 350 Bullet," " 500 Twin," 1950-53 inclusive

1. Description

The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is securely clamped to the facia panel fork head at the upper end and to the fork crown. Filled over the lower end of the main tube is the bottom tube made of steel tubing with a forged steel fork end flash-welded to it.* Fitted on the lower end of the main tube is a bronze 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 gland nut with an oil seal fitted inside it. 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 through the annular space between the bore of the valve port and the outside diameter of the "spring stud," which is formed with a double taper. Thus hydraulic damping is provided which is light at the normal position of the fork and becomes increasingly effective towards each end of the fork's travel. A compression spring is fitted inside the main tube and is secured by scrolls so that it is in tension on the rebound. The lower end of the main tube and upper end of the bottom tube are protected by a cover tube screwed to the fork crown. The upper end of the main tube is covered by a tube with a pressed steel lamp bracket welded to it.

The fork is filled with a light oil (S.A.E. 20) up to a level above the valve port, this oil providing both the damping medium and the lubricant for the bearings.

A special version of the fork is available for sidecar use. This has a modified fork head and fork crown setting the main tubes 1.1/2 in. further forward, thus giving less trail and providing lighter steering when used with a sidecar. These sidecar forks also are fitted with a steering damper and have stronger springs.

**On early models the fork end was made of aluminium alloy screwed on to the bottom tube.*

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

Place the machine on the stand and in the case of Model "G" or "J2" place a box beneath the crankcase to raise the front wheel from the ground. Disconnect the front brake control and remove the front wheel and mudguard complete with stays. Unscrew the oil level plug after placing a tray to catch any oil which may run out. Undo the nut which secures the spring stud to the fork end and knock the spring stud upwards into the fork with a soft mallet, thus allowing the remainder of the oil to escape.

Unscrew the outer cover tube using the hand grips E4912 thus exposing the gland nut which can be unscrewed with the hand grips E5417 using a bar through the bracket for the wheel spindle to prevent the bottom tube from turning. The bottom tube can now be withdrawn completely from the main tube leaving the bottom tube bush, oil seal and gland nut on the main tube.

Now unscrew the main tube valve port using "C" spanner E5418. The spring stud and spring can now be withdrawn from the lower end of the main tube.

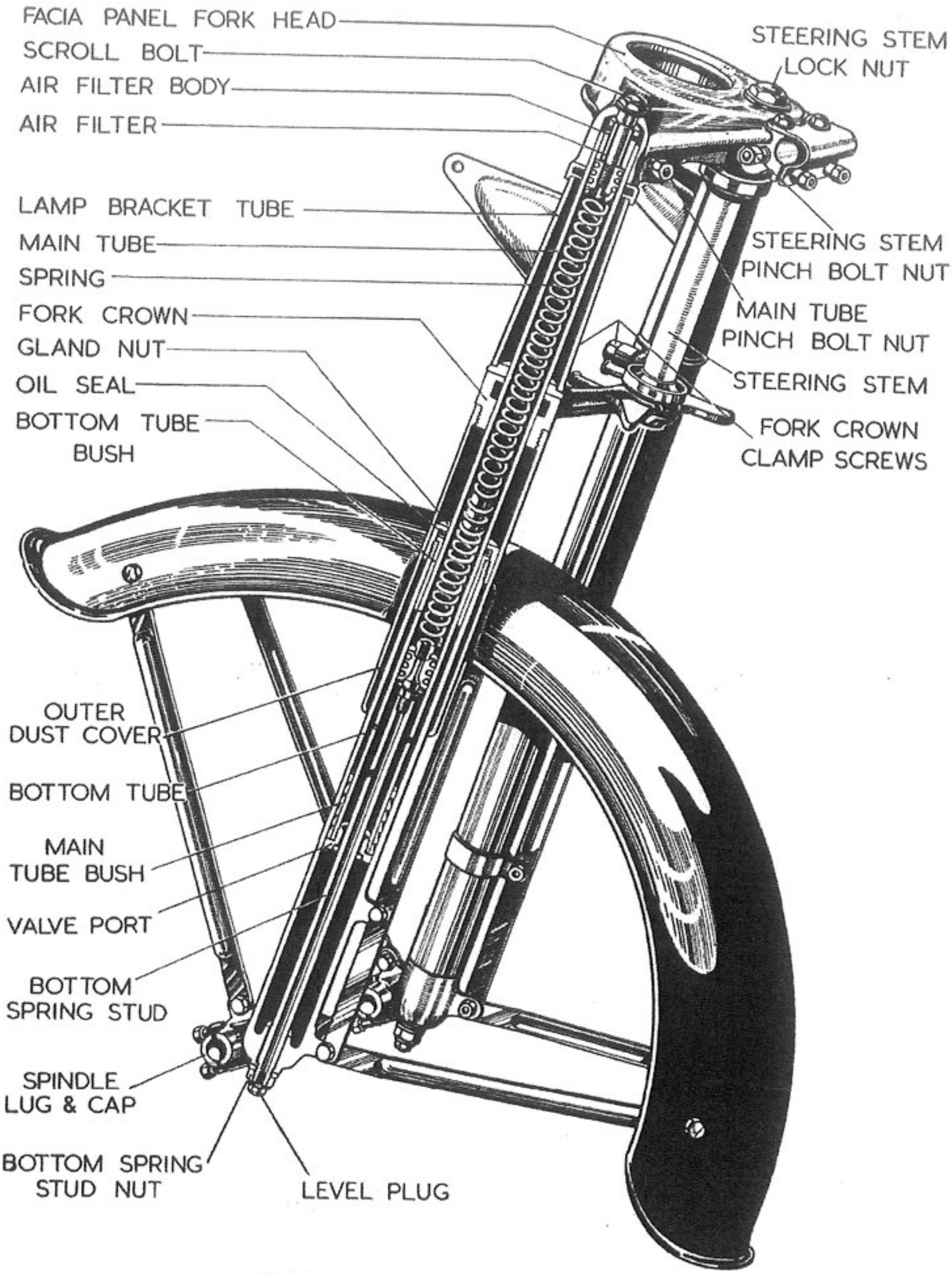
The bronze main tube bush can be now tapped off the lower end of the tube using the bottom tube bush for this purpose. The bottom tube bush, oil seal and gland nut can then be withdrawn.

3. Spring

The original length of the spring is 19 in. overall. A new spring should be fitted if the old one has set by more than 1 inch.

4. Steering Head Races

The steering head bearing consists of two deep groove thrust races each containing 19 x 1/4" diameter steel balls. The steering head bearing is adjusted by



SECTIONED VIEW OF TELESCOPIC FORK
Fig. 1

tightening the steering stem locknut after loosening the nuts on the three pinch bolts which secure the fork head to the steering stem and to the two main tubes. The head should be adjusted so 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.

Adjustment of the steering head depends on the ability of the fork head to slide on the steering stem and on the fork main tubes. A rubber washer is interposed between the fork head and the top of the lamp bracket tube to permit the necessary movement. If this rubber washer is fully compressed while there is still some play in the steering head, it will be necessary to remove the fork head (see paragraph 5) and shorten the lamp bracket tube by, say, 1/32 in. Alternatively, if the lamp bracket tube is loose when the steering head is correctly adjusted, it can be tightened by fitting an additional steel washer (Part No. 35974) beneath the rubber washer.

It is also possible that the steering head cannot be adjusted because the main tube is bottoming in the recess in the fork head in which it fits. In this case the fork crown clamp screws must be loosened, thus permitting the main tubes to slide through the fork crown. Do no forget to tighten the fork head pinch bolts and the fork crown clamp screws after adjusting the steering head.

5. Removal of Facia Panel Fork Head, Spring, etc.

To remove the Facia Panel Fork Head for access to the lamp bracket tubes (or to change the fork spring without disturbing the bearings) proceed as follows - disconnect all control cables at the handlebar end and remove the headlamp from the lamp brackets. The switch panel can conveniently be removed from the back of the lamp so that the body of the lamp can be removed completely.

Now unscrew the two Fork Spring Scroll Bolts from the fork head, unscrew the nuts on the fork head clip bolt and the two main tube clip bolts, remove the three clip bolt sleeves and knock out the three clip bolts. The facia panel fork head can now be tapped gently upwards with a hide mallet or a hammer and a wooden drift but care must be taken to hit only the more solid parts of the fork head, i.e. beneath the handlebar clip and at the back of the main tubes, avoiding the underside of the comparatively thin portion in front of the speedometer.

After removal of the fork head the lamp bracket tubes can be lifted straight off and the springs can be withdrawn from the upper end of the main tubes after unscrewing the oil level plug and the nut which secures the spring stud to the fork end and knocking the spring stud upwards.

6. Removal of Main Tubes

To remove the main tubes first dismantle the fork as described in paragraph 2, then remove the facia panel fork head and lamp bracket tubes as described in paragraph 5. Now loosen the fork crown clamp screws and knock the main tubes out of the fork crown either upwards or downwards as may be most convenient. If the machine has been in an accident and the tube is badly bent both above and below the fork crown, it may be necessary to cut through the tube with a hacksaw before it can be withdrawn.

7. Reassembly of Parts

No difficulty should be experienced with this. When refitting the main tube, use the lamp bracket tube as a guide to its correct position in the fork crown. The small shoulder some 1.1/2 in. from the upper end of the tube should be flush with the top of the lamp bracket tube when the latter is in position on the fork crown. With the main tube in this position, tighten the fork crown clamp screws before fitting the facia panel fork head.

If new oil seals have been fitted it may be found that the action of the fork is very stiff when the gland nuts are tightened down fully. In this case the nuts may be left half a turn or so slack until the seals have freed off, after which they should be tightened down. Note that the seal, must be fitted with the larger bore uppermost, i.e. with the scraping edges facing downwards.

When refitting the three clip bolts, which secure the fork head to the main tubes and steering stem, make sure that the clip bolts and their sleeve, are correctly fitted so that the cut-away portions of them bear against the tubes. Any attempt to tighten the nuts with the bolts or sleeves incorrectly fitted may result in cracking the facia panel fork head.

8. Lubrication

The lubrication of the fork bearings is effected by the oil which forms the hydraulic damping medium. The oil level is fixed by a cross hole in the spring stud leading to a drilled passage terminating in the oil level plug. To fill each fork leg to the correct level remove the plug screws from the fork head and the oil level plugs from the fork end. Pour oil in at the top until it runs out at the bottom of the fork. Wait till oil has stopped running and replace level plugs and plug screws.

Recommended grades of oil are Castrolite, Mobiloil Arctic, Essolube 20, B.P. Energol S.A.E. 20, Shell X-100 20/20 w.

SECTION KI

Front Wheel

With Dual 6 in. Brake

Fitted to " Meteor 700," 1953 onwards;
"500 Twin," "500 Bullet," "350 Bullet," 1955 onwards

1. Removal from Fork

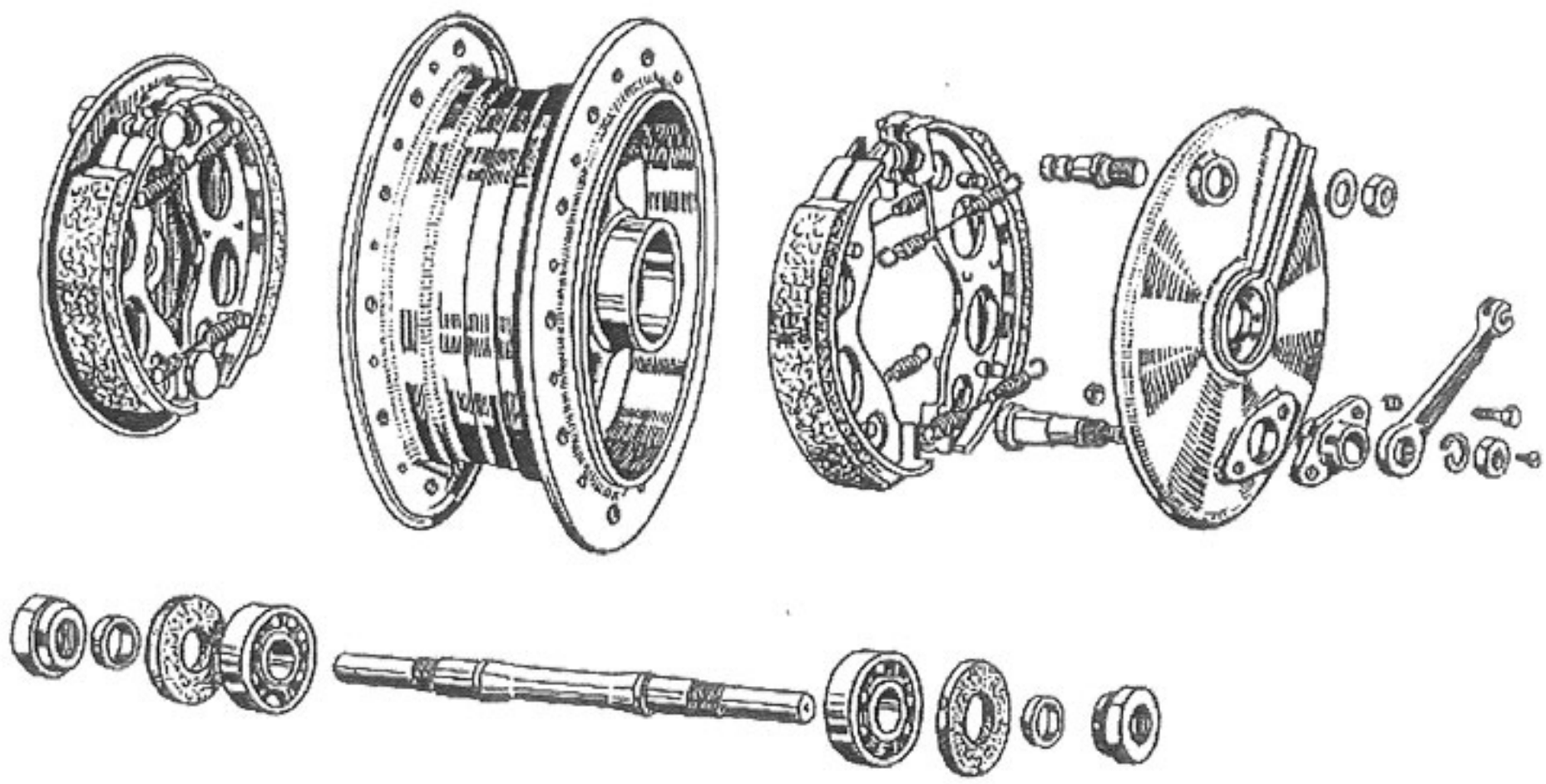
To remove the front wheel from the fork place the machine on the centre stand and front stand, if fitted, or alternatively with sufficient packing (about 2 in.) beneath each side of the stand to lift the wheel clear of the ground when tilted back on to the rear wheel. Slacken brake cable adjustments and disconnect cables from handlebar lever and from operating cam levers on hub. Unscrew the four nuts securing the fork bottom tube lug caps (Part No. 38593) and allow the wheel to drop forwards 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 Assemblies

Lock the brake "on" by pressure on the operating lever, 38905 (R.H.) or 38906 (L.H.), and unscrew the cover plate nuts 31347. The right and left hand cover plate assemblies can then be withdrawn from the respective brake drums.

3. Removal of Brake Shoes and Springs

This is best done by unscrewing the pivot pin locknuts, 28715, and the operating lever nuts, 10314, after which the assembly of brake shoes, return springs, pivot pin and operating cam can be removed from the cover plate by light blows with a hammer and drift on the ends of the pivot pin and the operating cam. The return springs, 29236, can then be unhooked from the shoe spring



DUAL FRONT BRAKE
Fig. 1

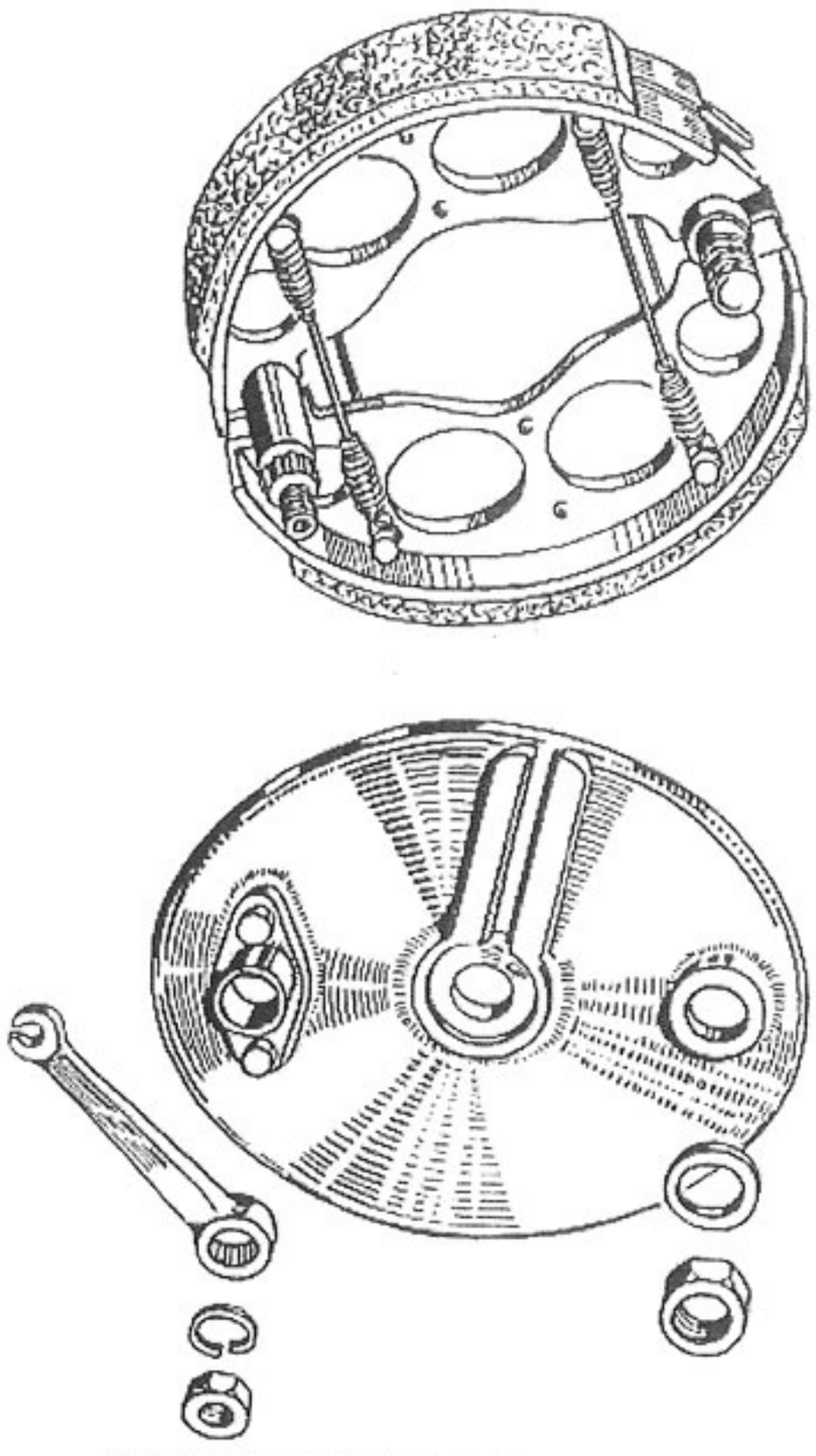
posts in the brake shoes thus allowing the whole assembly to fall apart.

4. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets (Part No. 37786BX) or ready fitted to service replacement brake shoes (Part No. 38042). 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 assemblies, lift out the felt washers, Part No. 21466, and distance pieces, Part No. 30538. Now hit one end of the wheel 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.



REMOVAL OF BRAKE SHOE ASSEMBLY
Fig. 2

6. Hub Bearings

These are deep groove single row journal ball bearings 5/8 in. i/d by 1.9/16 in. o/d by 7/16 in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Manes LJ5/8 in., Fischer LS7.

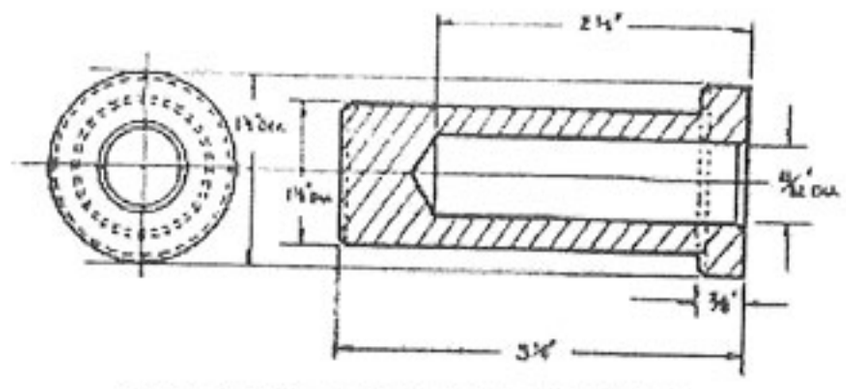
7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, 30538 which in turn are held up by the cover plate nuts 31347. 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. 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, this is shown in Fig. 3. One



DRIFT FOR REFITTING BEARINGS
Fig. 3

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. 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, 30538, and the cover plate nuts, 31347, with either the cover plates themselves or additional packing washers behind the 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. Reassembly of Brake Shoes onto Cover Plates

Assemble each pair of shoes with their return springs on to the pivot pin and operating cam, putting a smear of grease in the grooves of the pivot pin and on the operating faces of the cam. Now fit the assembly into the cover plate, putting a smear of grease on to the cylindrical bearing surface of the operating cam and secure with the pivot pin locknut, 28715, and washer, 17551. Fit the operating lever, 38905 or 38906, on its splines in a position to suit the extent of wear on the linings and secure with the nut, 10314, and washer, 14613. Note that the position of the operating levers may have to be corrected when adjusting the brake after refitting the wheel. The range of adjustment can be extended by moving these levers on to different splines. 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. Floating Cam Housings

Note that the cam housings, Part No. 26836, are intended to be left free to float. The bolt holes in the cam housings are slotted and the securing pins, Part No. 252, are provided with double coil spring washers beneath their heads to enable them to be tightened sufficiently to prevent the cam housings moving under the influence of road shocks, while at the same time they can be, and should be, left free enough to be capable of being moved by hand in the direction of the slots. The pins, 252 are secured by locknuts, 7916, which are centre punched as an additional precaution.

The leading shoes (i.e. those towards the rear of the machine) have a servo action which render them more effective than the trailing shoes. This servo action causes the linings on the leading shoes to wear more quickly than those on the trailing shoes and at the same time tends to lift the leading shoes off the cams and press the trailing shoes harder on to the cams. With a fixed cam housing the result is that the majority of the cam pressure is applied to the less efficient trailing shoe. By leaving the housing free to float, the cam can follow up the leading shoe thus maintaining equal pressure between the cam and the two shoes and so making full use of the more efficient leading shoe. Owing to the servo action the wear on the leading shoe with a floating cam housing is greater than that of the trailing shoe and in time the limit of float of the cam housing will be reached, after which the brake will continue to function as a fixed cam brake with some loss of efficiency. This can be restored by removing the shoes and fitting them in the opposite positions. Floating cam brakes are self-centering and there is no need to take any special precautions to see that the two linings are of equal thickness or that the brake shoe assembly is centered in the drum.

11. Refitting Brake Cover Plates

After assembling the brake shoe pivot pins and operating cams into the cover plates repack the hub bearings with grease. The 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.

Before fitting the distance washers and felt washers make sure that the inside of the brake drums are quite clean and free from oil or grease, damp, etc and replace the brake cover plate assemblies. Securely tighten the cover plate nuts, 31347.

12. Wheel Rim

The rim is Type WM2-19 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. Rim diameter after building is 19.062 in., tolerances on the circumference of the rim shoulders where the tyre fits being 59.930/59.870 in. The standard steel measuring tape for checking rims is 5/16 in. wide, .011 in. thick and its length is 59.964/ 59.904 in.

13. Spokes

The spokes are of the single butted type 8-10 gauge with 90° countersunk heads, angle of bend 95°-100°, length 6.5/8 in., thread diameter .144 in., 40 threads per inch, thread form British Standard Cycle.

14. Wheel Building and Truing

The spokes are laced one over two and the wheel rim must be built central in relation to the nuts which secure the brake cover plates. The rim should be trued as accurately as possible, the maximum permissible runout both sideways and radially being plus or minus 1/32 in.

15. Tyre

The standard tyre is Dunlop 3.25-19 in. ribbed 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 toolkit. 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.

16. Tyre Pressure

The recommended pressure for the front tyre is 18lb. per square inch for wheel loads up to 240 lb.

17. Lubrication

Two greasing points are provided both of which lead grease to 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) these greasing points are 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 cams are drilled for grease passages but the ends of these are stopped up with countersunk screws instead of being fitted with grease nipples. This is done to prevent excessive greasing by over-enthusiastic owners. If the cams are smeared with grease on assembly they should require no further attention but in case of necessity it is possible to remove the screws, fit grease nipples in their place and grease the cams by this means.

SECTION K2

Front Wheel

With Single 6 in. Brake

Fitted to 250 Clipper, Model S, G, J and J2. Also 350 + 500 Bullet, and 500 Twin up to the end of 1954

1. Removal from Fork

To remove the front wheel from the fork, place the machine on the centre stand (in the case of the spring frame models) with sufficient packing (about 2 in.) beneath each side of the stand to lift the wheel clear of the ground when tilted back on to the rear wheel. In the case of Models S, G and J place the machine on the rear stand and place a suitable box or block beneath the crankcase to lift the front wheel clear of the ground. 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 bottom tube lug caps (Part No. 38593) and allow the wheel to drop forwards 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 Assy.

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. Removal of Brake Shoes and Springs

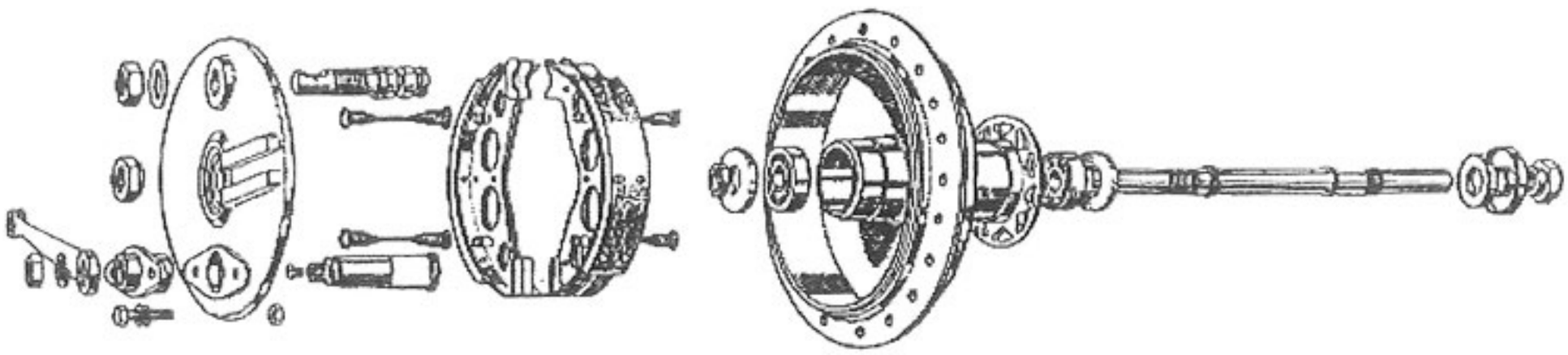
This is best done by unscrewing the pivot pin locknuts and the operating lever nuts after which the assembly of brake shoes, return springs, pivot pin and operating cam can be removed from the cover plate by light blows with a hammer and drift on the ends of the pivot pin and the operating cam. The return springs can then be unhooked from the spring posts in the brake shoes thus allowing the whole assembly to fall apart.

4. Replacing Brake Linings

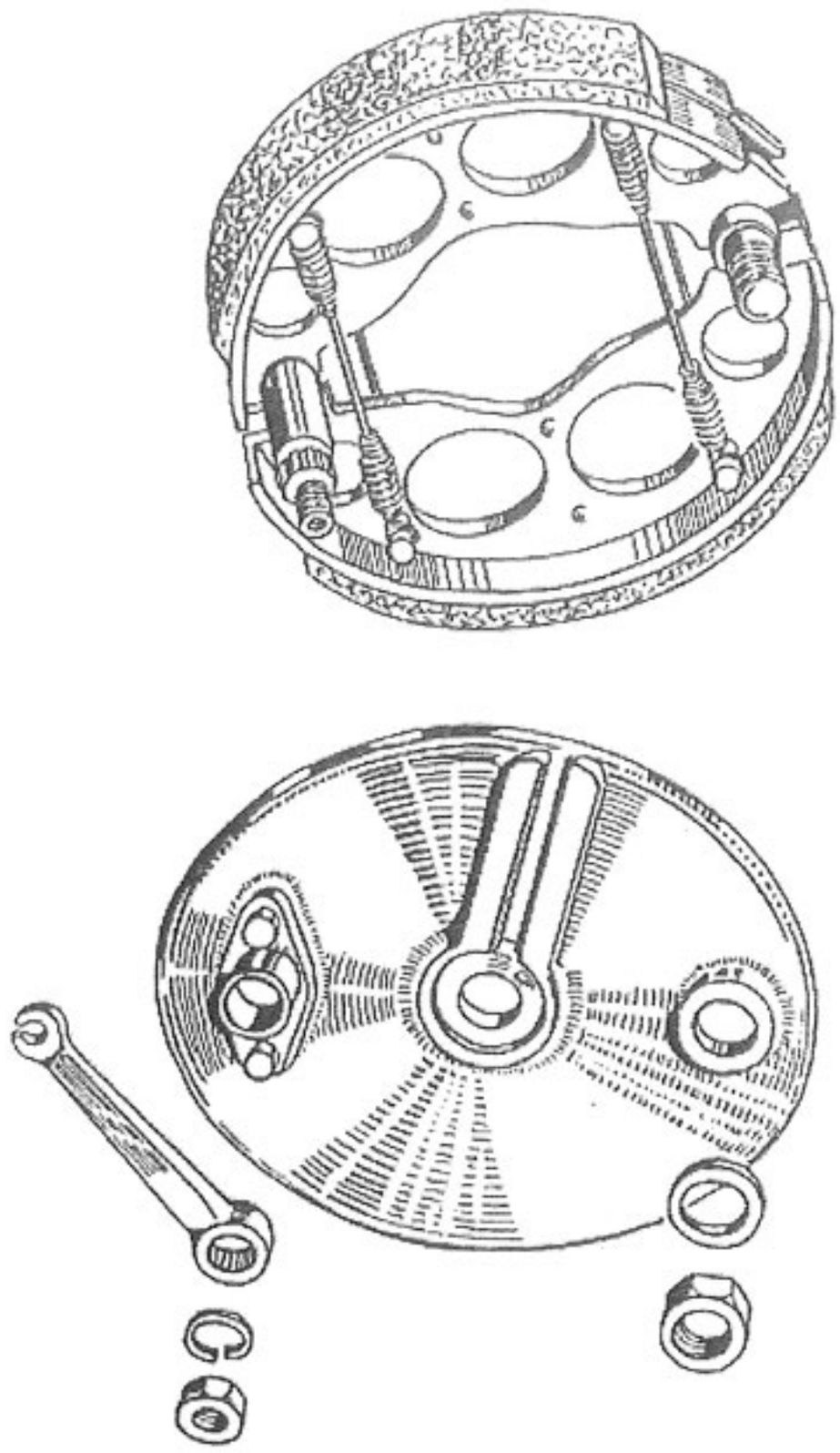
Brake linings are supplied either in pairs ready drilled complete with rivets (Part No. 37786BX) or ready fitted to service replacement brake shoes (Part No. 38042). When riveting linings to shoes secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard 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 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 the distance washer from the brake side 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



FRONT HUB
Fig. 1



REMOVAL OF BRAKE SHOE ASSEMBLY
Fig. 2

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, 5/8 in. i/d by 1.9/16 in. o/d by 7/16 in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ5/8 in., Fischer LS7.

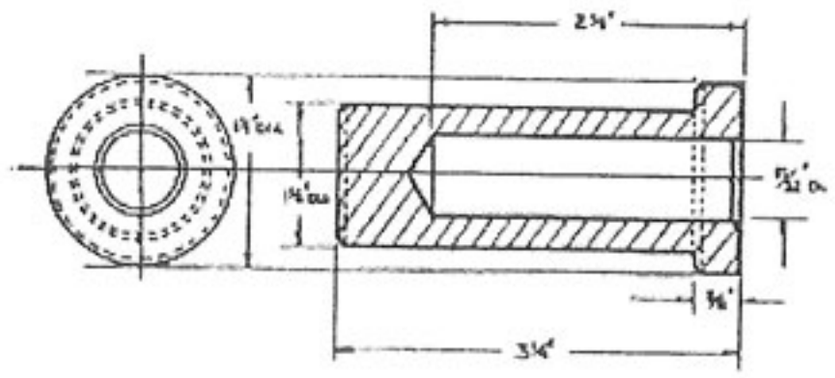
7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders 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 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. 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	1.5620/1.5616in.
Bearing bore	.6252/.6247 in.
Shaft diameter	.6252/.6248 in.

8. Refitting Ball Bearings

Note that the two ends of the spindle are not identical. The end with the longer plain portion between the thread and the shoulder is fitted to the brake side of the wheel. To refit the bearings in the hub two hollow drifts are required, as shown in Fig. 3. 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. 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 washer, cover plate, dust excluder and the



DRIFT FOR REFITTING BEARINGS
Fig. 3

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. Reassembly of Brake Shoes to Cover Plate

Assemble the shoes with their return springs on to the pivot pin and operating cam, putting a smear of grease in the grooves of the pivot pin and on the operating faces of the cam. Now fit the assembly into the cover plate, putting a smear of grease on to the cylindrical bearing surface of the operating cam and secure with the pivot pin locknut and washer. Fit the operating lever on its spline 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. Floating Cam Housing

Note that the cam housing is intended to be left free to float. The bolt holes in the cam housing are slotted and the securing pins are provided with double coil spring washers beneath their heads to enable them to be tightened sufficiently to prevent the cam housing moving under the influence of road shocks, while at the same time it can be, and should be, left free enough to be capable of being moved by hand in the direction of the slots. The pins are secured by locknuts which are centre punched as an additional precaution.

The leading shoe (i.e. the one towards the rear of the machine) has a servo action which renders it more effective than the trailing shoe. This servo action causes the lining on the leading shoe to wear more quickly than that on the trailing shoe and at the same time tends to lift the leading shoe off the cam and press the trailing shoe harder on to the cam. With a fixed cam housing the result is that the majority of the cam pressure is applied to the less efficient trailing shoe. By leaving the housing free to float the cam can follow up the leading shoe thus maintaining equal pressure between the cam and the two shoes and so making full use of the more efficient leading shoe. Owing to the servo action the wear on the leading shoe with a floating cam housing is greater than that of the trailing shoe and in time the limit of float of the cam housing will be reached, after which the brake will continue to function as a fixed cam brake with some loss of efficiency. This can be restored by removing the shoes and fitting them in the opposite positions. Floating cam brakes are self-centering and there is no need to take any special precautions to see that the two linings are of equal thickness, or that the brake shoe assembly is centered in the drum.

11. Refitting Brake Cover Plate

After assembling the brake shoe pivot pin and operating cam into the cover plate repack the hub bearings with grease. The 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 in to the hubs.

Before fitting the distance washer and felt washer make sure that the inside of the brake drum is quite clean and free from oil or grease, damp, etc. and replace the brake cover plate assembly. Securely tighten the cover plate nut.

12. Wheel Rims

The rim used on the 250 Clipper and Model "S" is type WM1-19 in., internal width 1.60 in. The rim used on the other models is type WM2-19 in., internal width 1.580in.

The rim diameter after building is the same in each case, i.e. 19.062 in., the tolerances on the circumference of the rim shoulders where the tyre fits being 59.930/59.870 in. The standard steel measuring tape for checking rims is 5/16 in. wide, .011 in. thick and its length is 59.964/59.904 in. All rims are pierced with forty holes for spoke nipples.

Note that two makes of rim are used "Dunlop" and "Palmer Jointless." These differ in the positions of the pierced spoke holes. The Dunlop rims have a group of three holes on one side of the centre line, then a single hole on the other side, a further group of three and a single hole and so on. Palmer rims have the holes alternately spaced either side of the centre line. Both rims are interchangeable and both use the same length spokes but the method of lacing the wheel is different (see Subsection 14). Neither types of the wheel rim are symmetrical and care must be

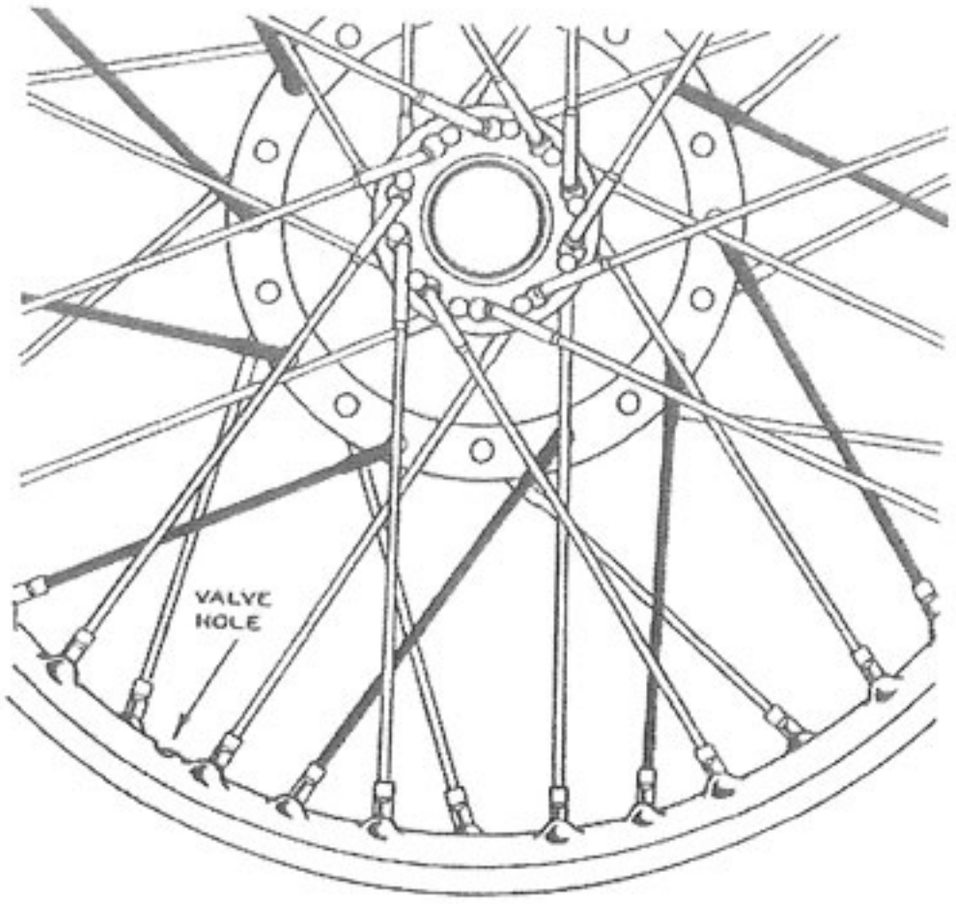


Fig. 4A Dunlop Rim

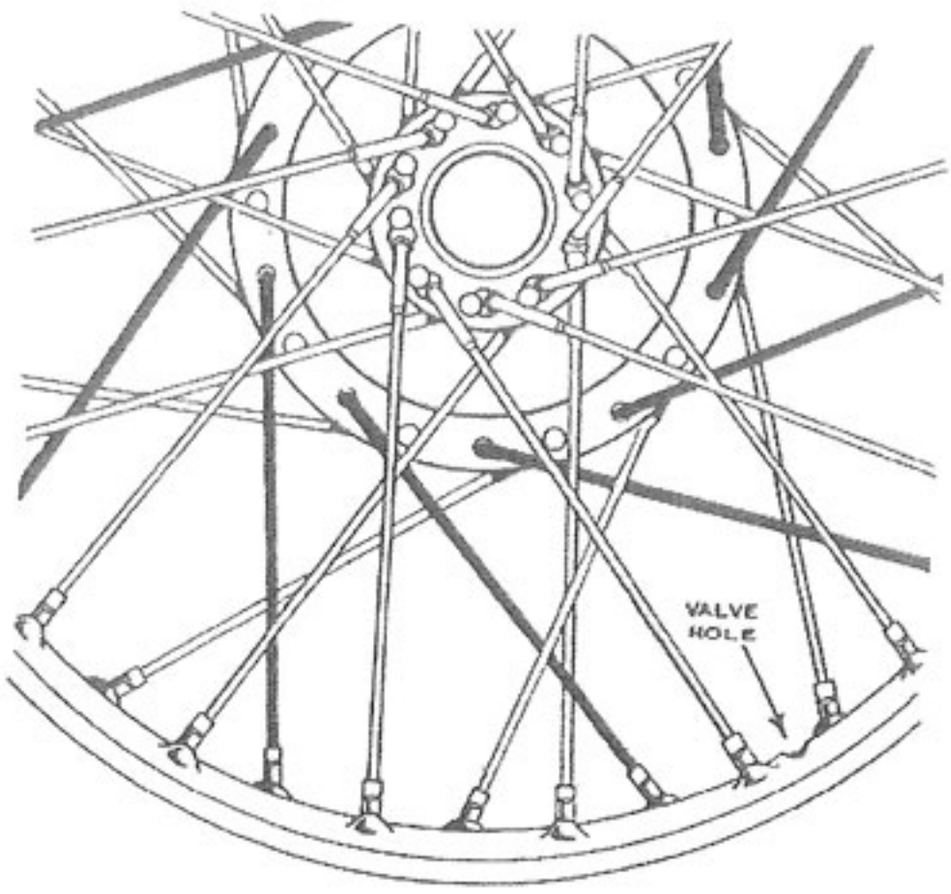


Fig. 4B Palmer Rim

WHEEL LACING

taken that they are built the right way round into the wheel.

13. Spokes

The spokes are of the single butted type 8-10 gauge with 90° countersunk heads, angle of bend 95°-100°, length 6.5/8 in. brake drum side, 8.1/2 in. spoke flange side, thread diameter .144 in., 40 threads per inch, thread form British Standard Cycle.

14. Wheel Building and Truing

The spokes are laced one over two on the brake side and one over three on the spoke flange side of the wheel. The wheel 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 1/32 in.

Figs. 4A and 4B show the difference between the lacing when using Dunlop and Palmer rims. The key to correct lacing is the inside spokes to the large flange on the brake drum side 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 (see Subsection 12) 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 brake drum is on the left, i.e. the inside spokes to the large flange cross from the left to the right of the centre line.

With the Palmer rim the spokes from the large flange on the brake drum side go to the more steeply angled holes in the rim which must be on the left of the centre line when the brake drum is on the left, i.e. none of the spokes crosses from left to right of the centre line.

15. Tyres

Standard tyres on the "250 Clipper" and "Model S" are Dunlop 3.00-19 in. Lightweight Reinforced and on the other models Dunlop 3.25-19 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 tyres can be manipulated quite easily with the small levers supplied in the toolkit. 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.

16. Tyre Pressures

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

Tyre Section Inches	Inflation Pressure—lb. per sq. in.		
	18	20	24
	Load per tyre—lb.		
3·00	180	200	240
3·25	240	280	300

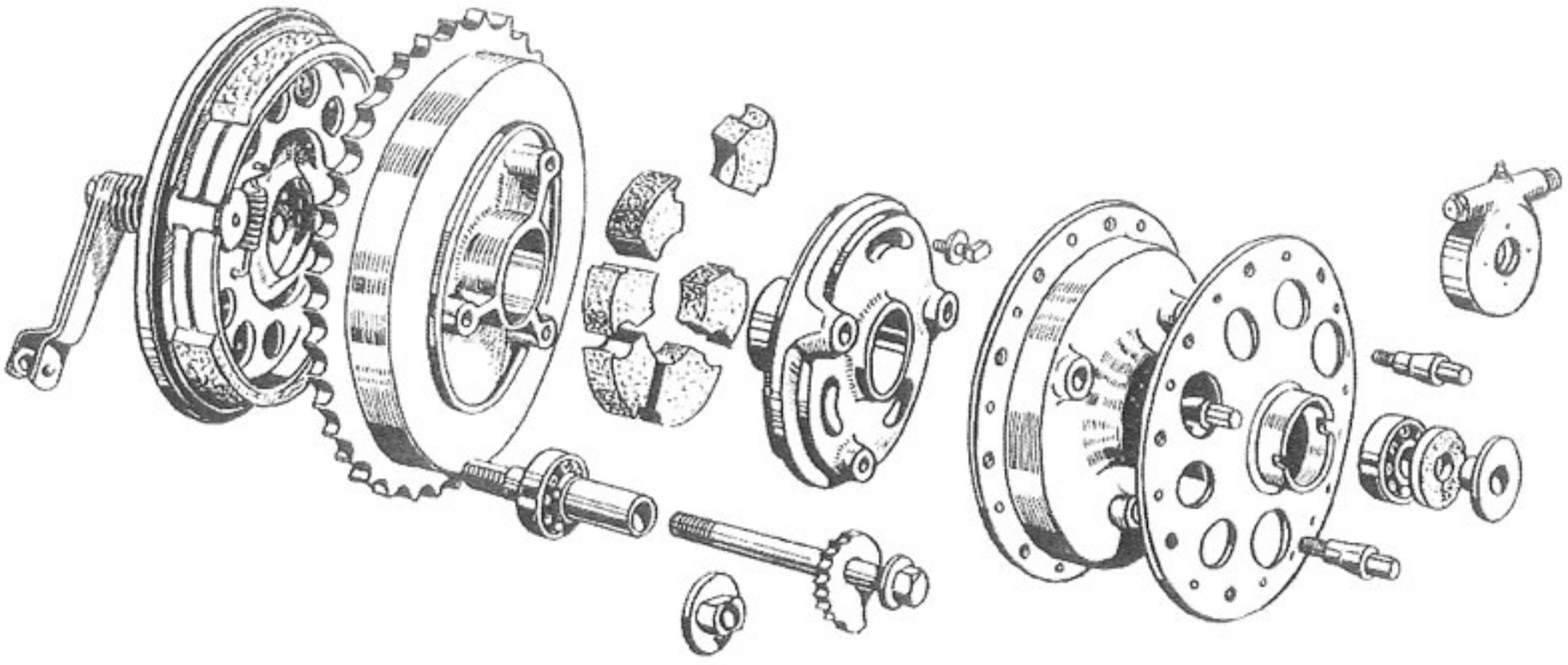
17. Lubrication

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 L1

Rear Wheel (Detachable Type)



DETACHABLE REAR WHEEL
Fig. 1

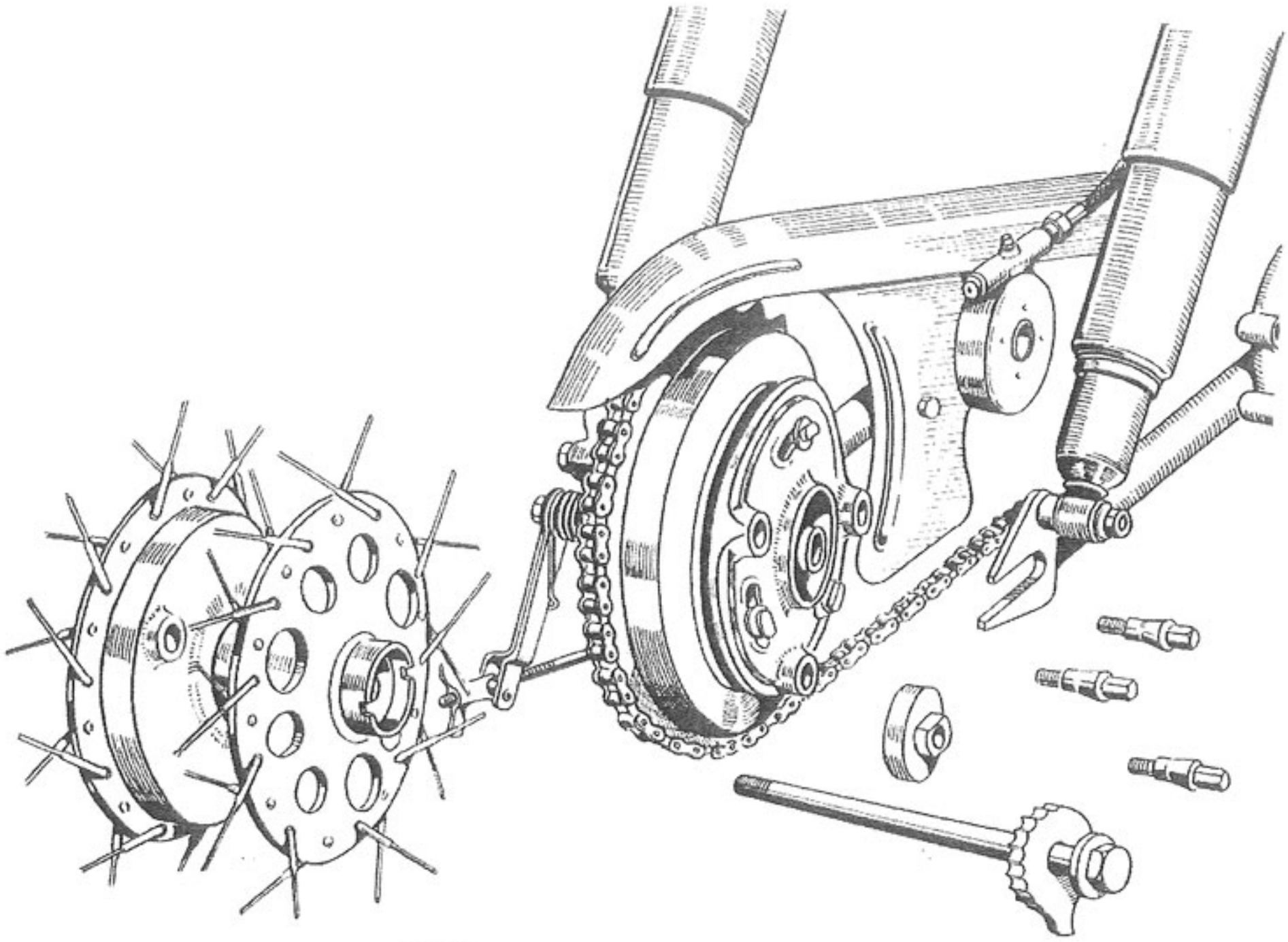
1. Description

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. Remove the dual seat (if fitted) and the detachable portion of the rear mudguard. Unscrew the three attachment bolts, 39316. Unscrew the loose section of the spindle, 39336, and withdraw this together with the chain adjuster cam, 36649, preferably marking this to ensure that it is replaced in the same position. Now slide the distance collar, 39323, out of the fork end and lift away the speedometer drive gearbox which can be left attached to the driving cable. The spacing collar, 39321, 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 it from the fixed section of the hub barrel and the cush drive shell and enabling the wheel to be lifted out of the machine.

When replacing the main portion of the wheel reverse the foregoing procedure, locating the wheel by the loose section of the spindle with the speedometer drive gearbox and distance collar in position before replacing the three attachment bolts, 39316. The cush drive shell can be prevented from rotating when turning the wheel to line up the holes for the attachment bolts if the machine is placed in gear or the rear brake is operated. When replacing the speedometer drive gearbox care must be taken to ensure 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.



REMOVAL OF MAIN PORTION OF WHEEL
Fig. 2

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

Place the machine on the centre stand and remove the dual seat (if fitted) and detachable portion of the rear mudguard as if for removal of the main portion of the wheel only. 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, 7598, and remove this together with the washer behind it. Unscrew the loose section of the spindle, 39336, two or three turns and the spindle nut, 36651, 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, 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 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

* 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.

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. 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 Fitting New Linings, etc.

Remove the complete wheel as described above, then remove the spindle nut, 36651, chain adjuster and the distance collar, 39315, thus permitting the complete brake cover plate 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.

5. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets, 37787BX, or ready fitted to service replacement brake shoes, 38043. 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.

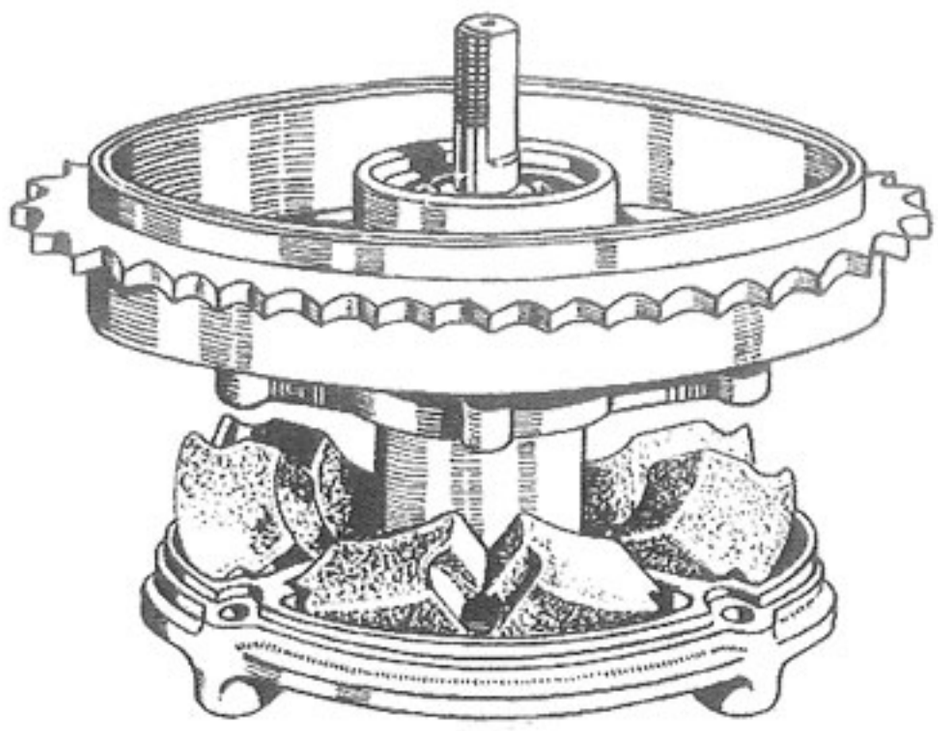
6. Removal of Brake Operating Cam and Brake Shoe Pivot Pin

The pivot pin is threaded into the torque plate, from which it can be unscrewed after removing the locknut 39351. (Note the Part Number of the torque plate only is 36527 while the thin pressed steel cover plate is 36526. These two are riveted together and supplied as one unit Part Number 32525).

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.

7. Cush Drive

The sprocket/brake drum, 39301, 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, 39302. 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



RE-ASSEMBLY OF CUSH DRIVE
Fig. 3

both driving and braking torques 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 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, 39336, completely and also the three attachment bolts, 39316. The main portion of the wheel can then be lifted away from the assembly consisting of the fixed section of the hub barrel, 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, thus giving access to the three cush drive ring locking pins, 8718. Unscrew these and then unscrew the cush drive pins, 39310, thus enabling the sprocket/brake drum to be separated from the cush drive shell, after which the six cush drive rubbers can be 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 painted with soapsuds to facilitate entry of the vanes. The three cush drive pins, 39310, should be tightened as far as possible and then slackened back half to one turn to enable the locking pins, 8718, to be fitted.

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. Put grease also behind the washers on the three cush drive pins, 39310.

8. 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 fixed section of the hub barrel first remove the brake cover plate complete with brake shoe assembly; then remove the felt washer, 9484, and distance collar, 11203. 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 bearing from the loose half of the hub barrel first lift away the distance collar, 39323, speedometer drive gearbox, the spacing collar, 39321, and the felt washer, 9484. Now enter the loose section of the spindle into the distance tube, 39312, from the driving sprocket end and drive out the distance tube with the two distance tube washers, 39313, and the bearing by means of a hammer and drift applied to the hexagon headed end of the loose section of the spindle.

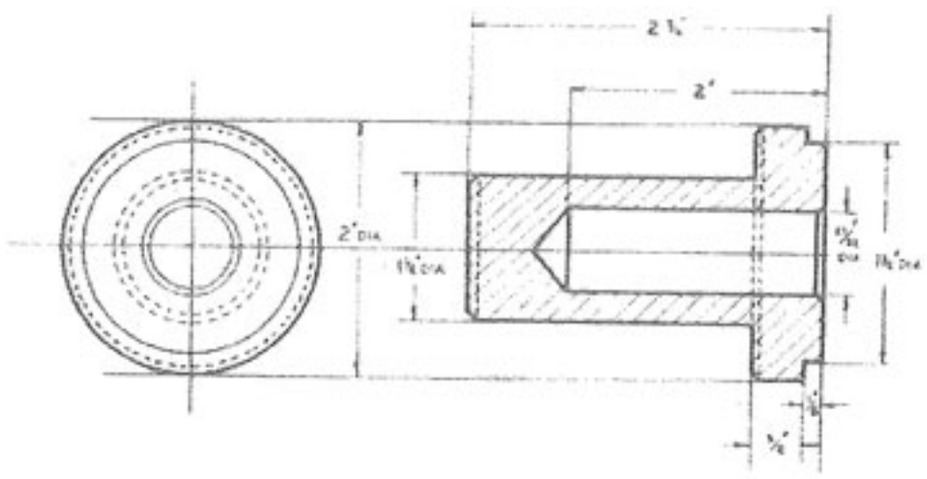
9. Hub Bearings

These are deep groove single row journal ball bearings 5/8 in. i/d by 1.13/16 o/d by 5/8 in. wide. The Skefko Part Number is RMS5. Equivalent bearings of other makes are Hoffmann MS7, Ransome and Marles MJ5/8 in., Fischer MS7.

10. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on to the spindle by the various distance pieces. In order to prevent endways pre-loading of the bearings, it is essential that, when everything is locked up, there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in each half 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. 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	1.8122/1.8117 in.
Housing bore	1.8115/1.8110in.
Bearing bore	.6252/.6247 in.
Shaft diameter (Loose side)	.624/.622 in.
Shaft diameter (Fixed side)	.6252/-6248 in.



DRIFT FOR REFITTING BEARING (FIXED SECTION)

Fig. 4

11. Refitting Ball Bearings

In order to prevent the possibility of endways pre-loading of the bearings the following procedure should be followed carefully when fitting new bearings or refitting old ones

(a) The bearing in the fixed section of the hub barrel should be fitted first together with the fixed section of the spindle using a special drift, as shown in Fig. 4, preferably under a press, if necessary using light hammer blows. This drift prevents the bearing being pushed right down to the bottom of its recess.

(b) The bearing in the loose half of the barrel is pressed in using either the drift part of E.4823, or a suitable piece of tube 1.3/4 in. diameter with the end ground square so as to put pressure on the outer race of the bearing only. This bearing should be pressed or knocked only about half way into its recess at the present stage.

(c) The two parts of the wheel are put together and the three attachment bolts, 39316, are fitted and tightened.

(d) The bearing in the loose half of the barrel is now driven home by means of the same drift until further movement is prevented by the inner face of the inner race coming against the end of the distance tube, 39312.

As a check that the bearings are fitted correctly the loose section of the spindle and the spindle nut, 36651, can be fitted with suitable distance pieces beneath them so that, when the spindle and spindle nut are tightened, pressure is put on to the inner races of the bearings. When tightened solid the spindle should still be quite free to turn with the fingers. If the spindle is free before the nuts are tightened but not free afterwards, it is evident that there is end load on the bearings due to the bearing in the loose half of the hub not having been fitted deep enough in its recess. In this case the outer race should be tapped home with a tubular drift.

12. 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 to the cylindrical bearing surface of the operating cam if this has been removed. Fit the operating lever and trunnion, 23371, 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.

13. Centering Cam Housing

Note that the bolt holes in the cam housing, 26347, 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, 26309 and 35140, 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.

14. 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, 39315 and 39323, chain adjuster cams, the loose section of the spindle and the spindle nut 36651. The wheel is then ready for reassembly into the machine.

15. Wheel Rim

The wheel rim is type WM2-19 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 19.062 in., the tolerances on the circumference of the rim shoulders where the tyre fits being 59.930/59.870 in. The standard steel measuring tape for checking rims is 5/16 in. wide, .011 in. thick and its length is 59.964/ 59.904 in.

16. Spokes

The spokes are of the single butted type 8-10 gauge with 90° countersunk heads, angle of bend 95°-100°, length 6.5/8 in., thread diameter .144 in., 40 threads per inch, thread form British Standard Cycle.

17. 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 39315 and 39323. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus 1/32 in.

18. Tyre

The standard tyre is Dunlop 3.50-19 in. Universal 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 toolkit. 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.

19. Tyre Pressures

The recommended pressures for the rear tyre are 16 lb. per square inch for wheel loads not

exceeding 280 lb, 18 lb per square inch for loads up to 320 lb., 20 lb. per square inch for loads up to 350 lb., 24 lb. per square inch for loads up to 400 lb., 28 lb. per square inch up to 450 lb. and 32 lb. per square inch up to 500 lb.

20. Lubrication

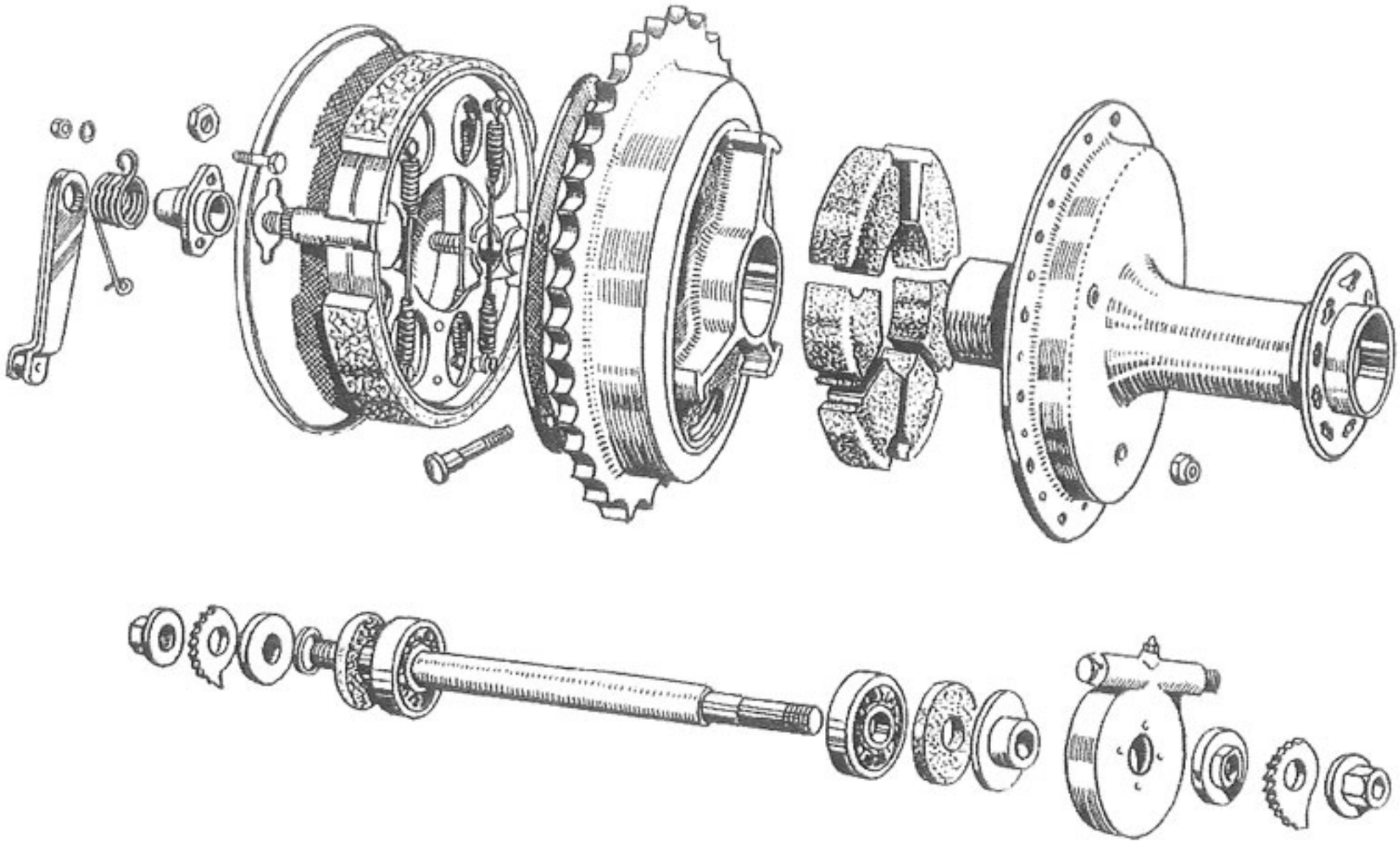
A greasing point is provided in the centre of the hub barrel. Unless the barrel is packed full with grease on assembly (which is apt to lead to trouble through grease finding its way past the felt seals on to the brake linings) this way to grease the bearings is by packing them with grease after dismantling 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 L2

Rear Wheel (Non-Detachable Type)

Part No. 36788 for " 500 Twin" and " 350 Bullet"; Part No. 37278 for "Meteor 700" and " 500 Bullet."



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.

The heavier type used on the Meteor 700 and 500 Bullet has a 7 in. diameter brake drum while the lighter type used on the 500 Twin and 350 Bullet has a 6 in. diameter brake.

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.

In the case of the 7 in. brake fitted to the "Meteor 700" and "500 Bullet" models, the brake shoes can then be removed, after detaching the return springs.

In the case of the 6 in. brake fitted to the "500 Twin" and "350 Bullet" Models, unscrew the pivot pin locknut and the operating lever nut, after which the assembly of the brake shoes, return springs, pivot pin and operating cam can be removed from the cover plate by unscrewing the pivot pin and applying light blows with a hammer and drift on the end of the operating cam. The return springs can then be unhooked from the spring posts in the brake shoes, thus allowing the whole assembly to fall apart.

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 lighter bearings used in the "350 Bullet" and "500 Twin" hubs are 5/8 in. i/d by 1.9/16 in. o/d by 7/16 in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ 5/8 in., Fischer LS7.

The heavier bearings used in the "Meteor 700" and "500 Bullet" Models are 5/8 in. i/d by 1.13/16 in. o/d by 5/8 in. wide. The Skefko Part No. is RMS5. Equivalent bearings of other makes are Hoffmann MS7, Ransome and Marles MJ5/8 in., Fischer MS7.

7. Fitting Limits for Bearings

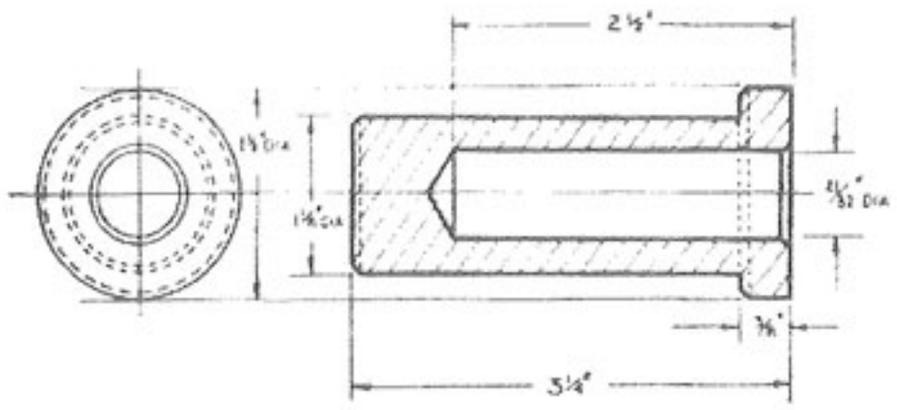
The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, which in turn are held up by the cover plate nuts. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between 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. 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.

	"350 Bullet" and "500 Twin"	**"Meteor 700" and "500 Bullet"**
Bearing o/d	1.5622/1 5617 in.	1 8122/1 8117 in.
Housing bore	1.5620/1.5615 in.	1.8115/1.8110in.
Bearing bore	.6252/.6247 in.	.6252/.6247 in.
Shaft diameter	.6252/.6248 in.	.6252/.6248 in.

8. Refitting Ball Bearings

To refit the bearings in the hub two hollow drifts are required, as shown in Figs. 2 and 3. One bearing is first fitted to one end of the spindle by means of the hollow drift; the spindle and bearing are then

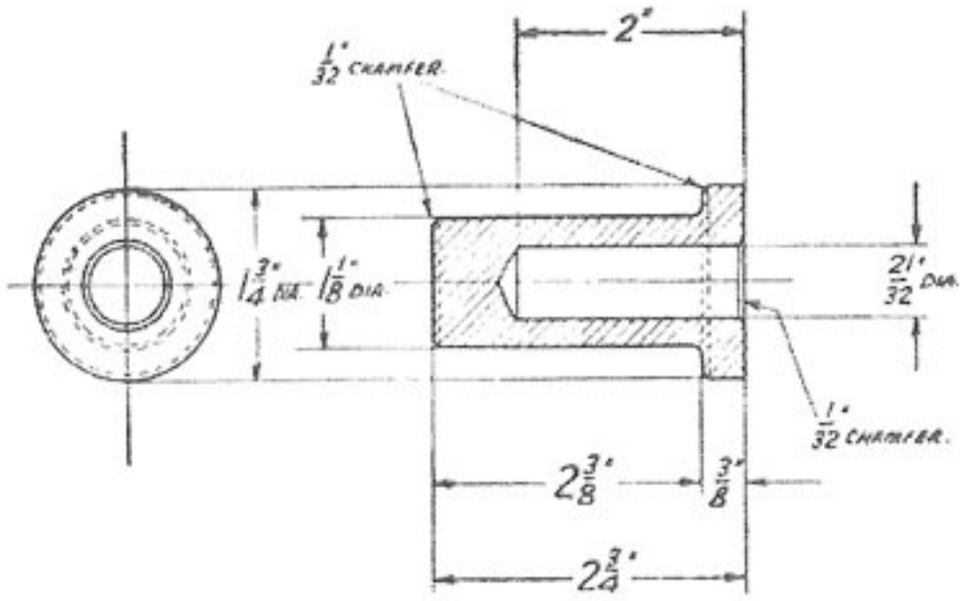
entered into one end of the hub barrel which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper end of the spindle and driven home by means of the second hollow drift either under a press or by means of a hammer which will thus drive both bearings into position simultaneously.



DRIFT FOR REFITTING BEARINGS
"350 Bullet" "500 Twin"

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



DRIFT FOR REFITTING BEARINGS
"Meteor 700" "500 Bullet"

Fig. 3

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.

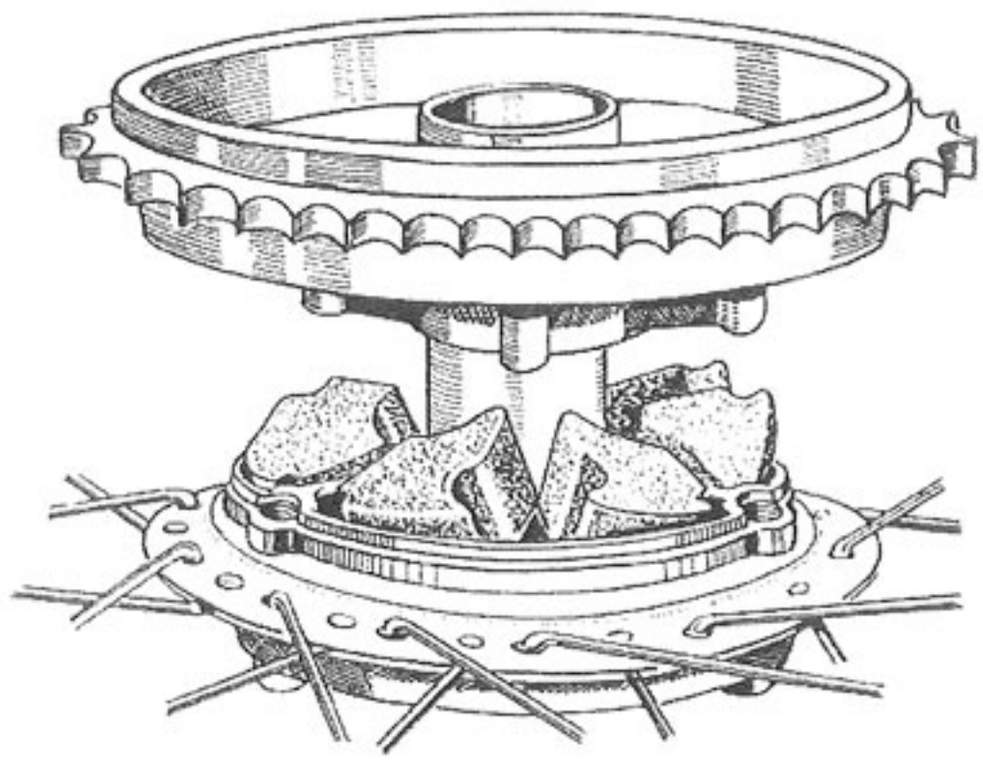
9. Removal of Brake Operating Cam and Brake Shoe Pivot Pin

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 1/2 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, 32431, 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. 4

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 faciliate 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, 10097. 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 WM2-19 in. pierced with 40 holes for spoke nipples. The internal width is 1.580in. and the diameter after building 19.062 in., the tolerance on the circumference of the rim shoulders where the tyre fits being 59.930/59.870 in. The standard steel measuring tape for checking rims is 5/16 in. wide, .011 in. thick and its length is 59.964/59.904 in.

Note that two makes of rim are used "Dunlop" and "Palmer Jointless." These differ in the positions of the pierced spoke holes. The Dunlop rims have a group of three holes on one side of the centre line, then a single hole on the other side, a further group of three and a single hole and so on. Palmer rims have the holes alternately spaced either side of the centre line. Both rims are interchangeable and both use the same length spokes but the method of lacing the wheel is different (see paragraph 16). Neither type of rim is symmetrical and care must be taken that they are built the right way round into the wheel.

15. Spokes

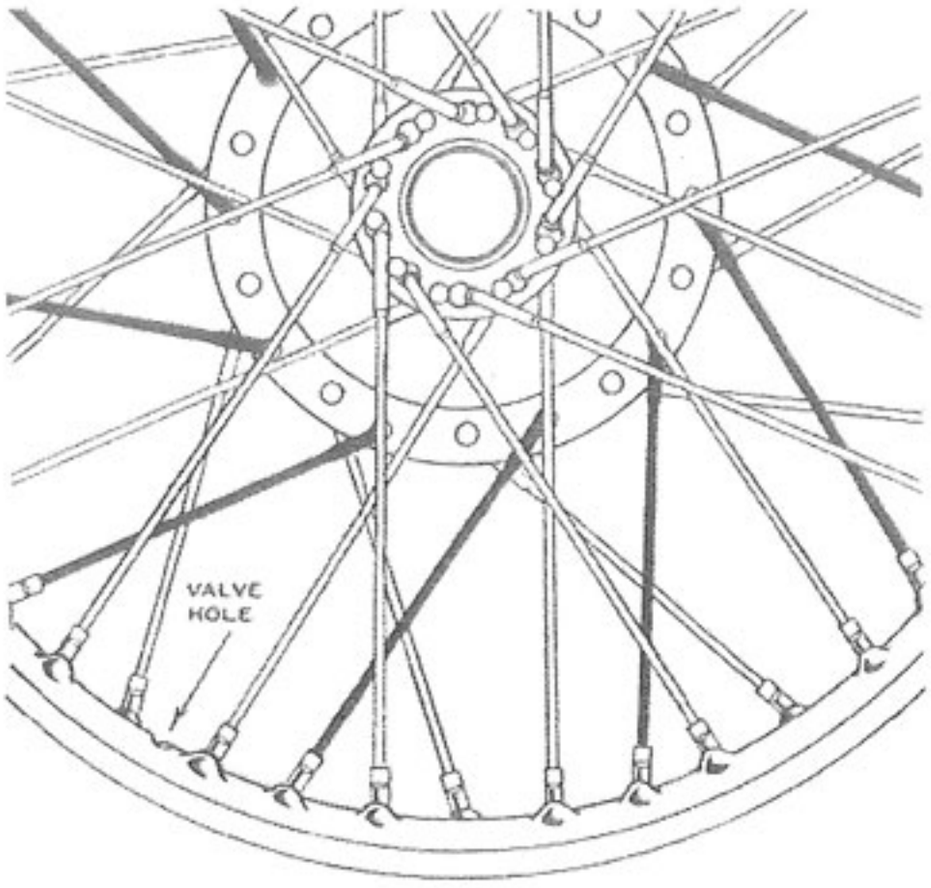
The spokes are of the single butted type 8-10 gauge with 90° countersunk heads, angle of bend 95°100°, thread diameter .144in., 40 threads per inch, thread form British Standard Cycle. Spoke lengths are as follows.

"Meteor 700," and "500 Bullet,"
Cush drive side, 7.3/4 in.
Spoke flange side 8.1/2 in.

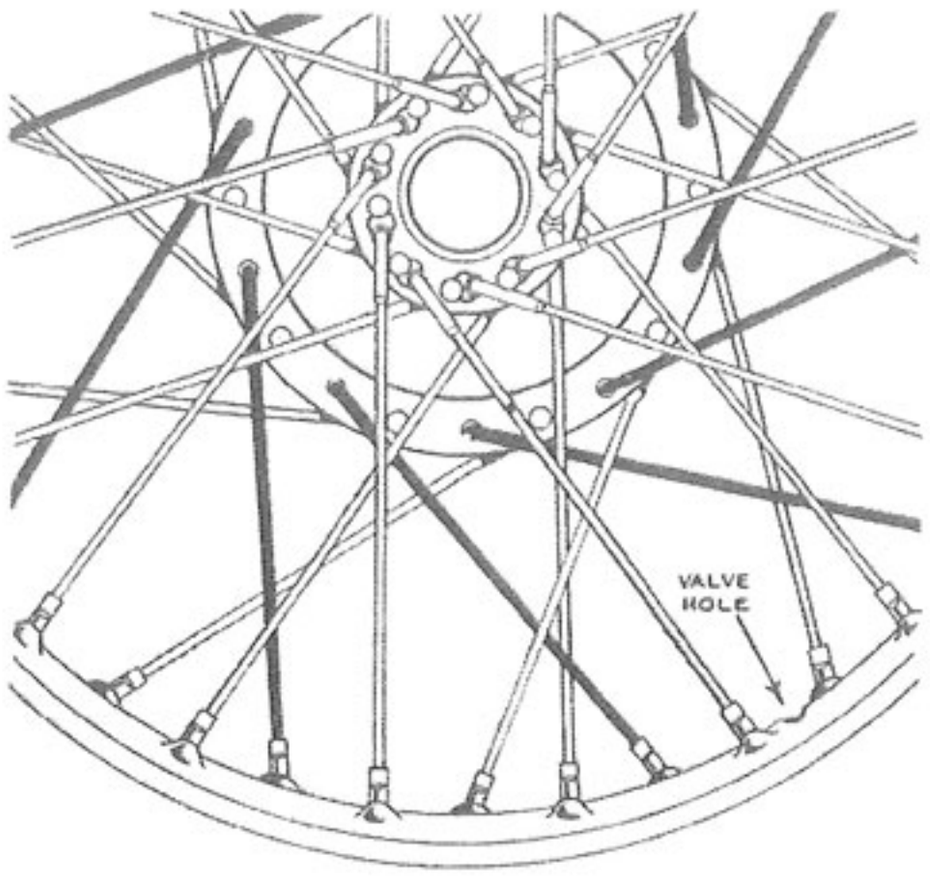
"500 Twin" and "350 Bullet,"
Cush drive side, 7.7/8 in.
Spoke flange side 8.5/8 in.

16. Wheel Building and Truing

The spokes are laced one over three. The wheel must be built central in relation to the outer faces of the distance collars which fit



DUNLOP RIM
Fig. 5A



PALMER RIM
Fig. 5B

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 1/32 in.

Fig. 5 shows the difference between the lacing when using Dunlop and Palmer rims. 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. 5. With the Dunlop rim this spoke goes to the middle hole of one of the groups of three (see paragraph 14) 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.

With the Palmer rim the spokes from the large flange on the cush drive shell go to the more steeply angled holes in the rim which must be on the left of the centre line when the cush drive is on the left, i.e. none of the spokes crosses from left to right of the centre line.

17. Tyres

Standard tyres are Dunlop 3.50-19 in. Universal tread except on the "350 Bullet" where a 3.25-19 in. Universal tyre is used.

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 toolkit. 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
3·50	280	320	350	400	450	500

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

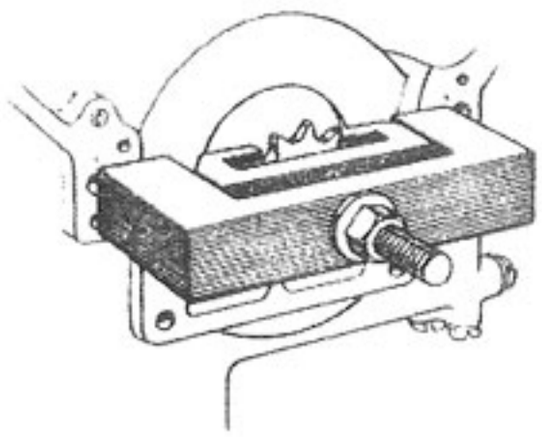
through grease finding its way past the felt seals on to the brake linings) this greasing point is of little value and the best way to grease the bearings is by packing them with grease after dismantling the hub as described above.

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.

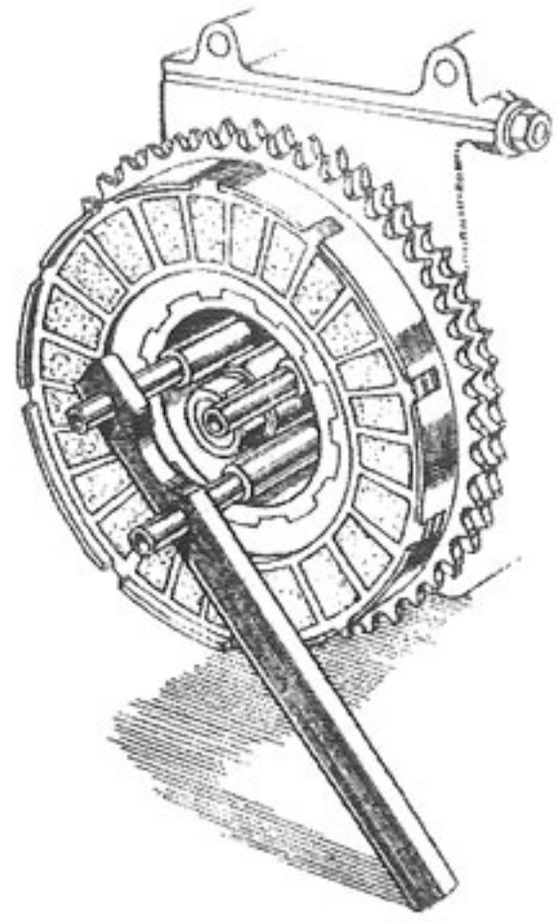
Section M1

Special Tools

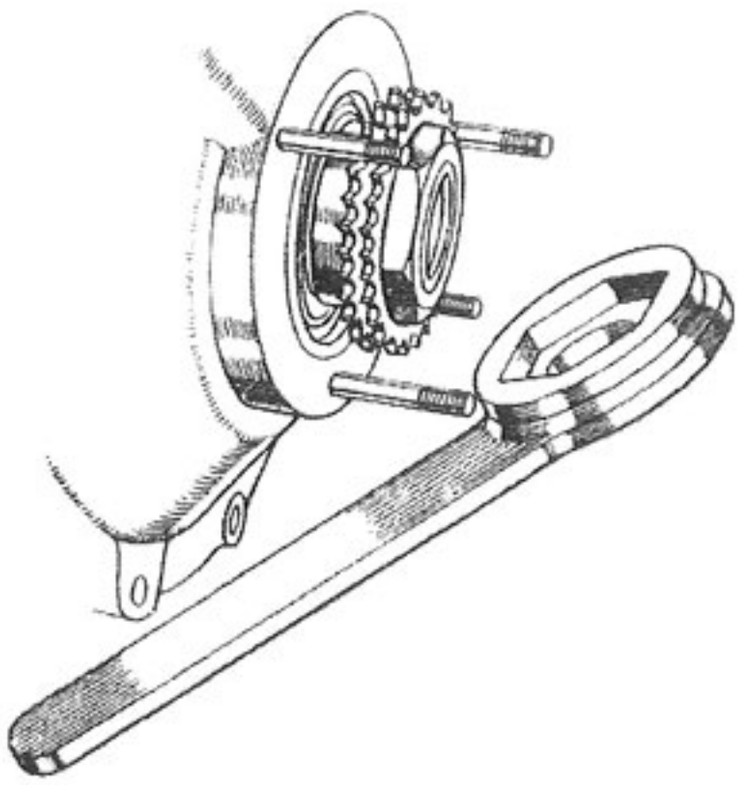
For 500 Twin and 700 Meteor



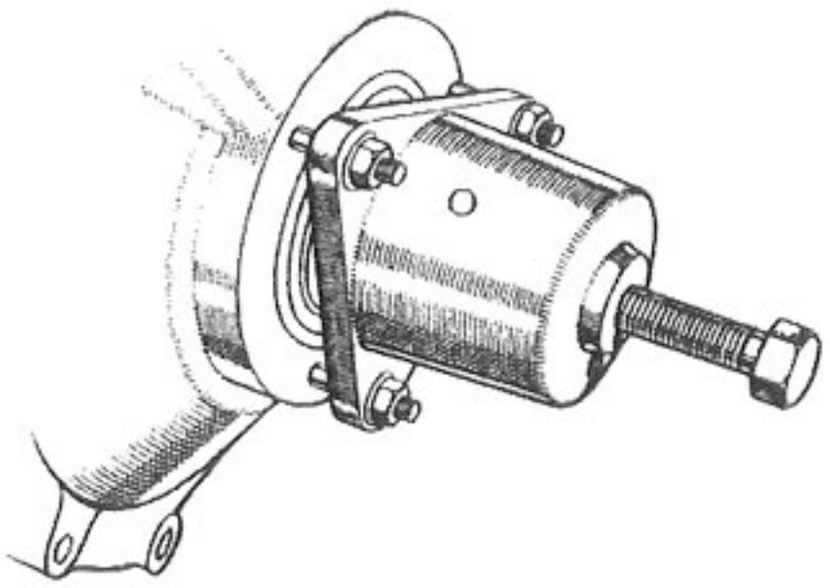
E.4869
TIMING SPROCKET EXTRACTOR



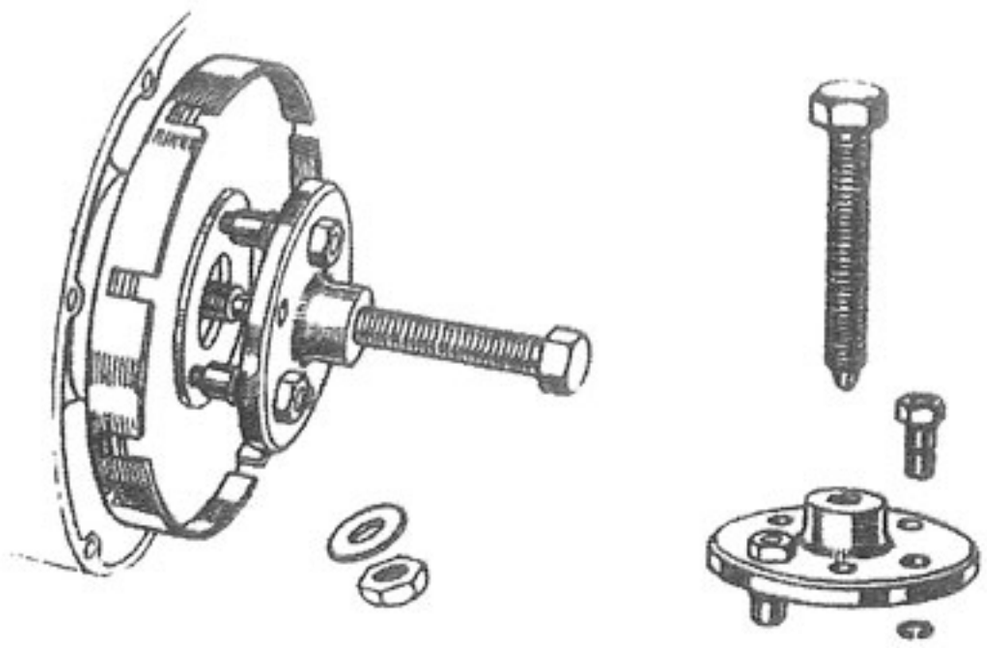
E.4871
CLUTCH HOLDING TOOL



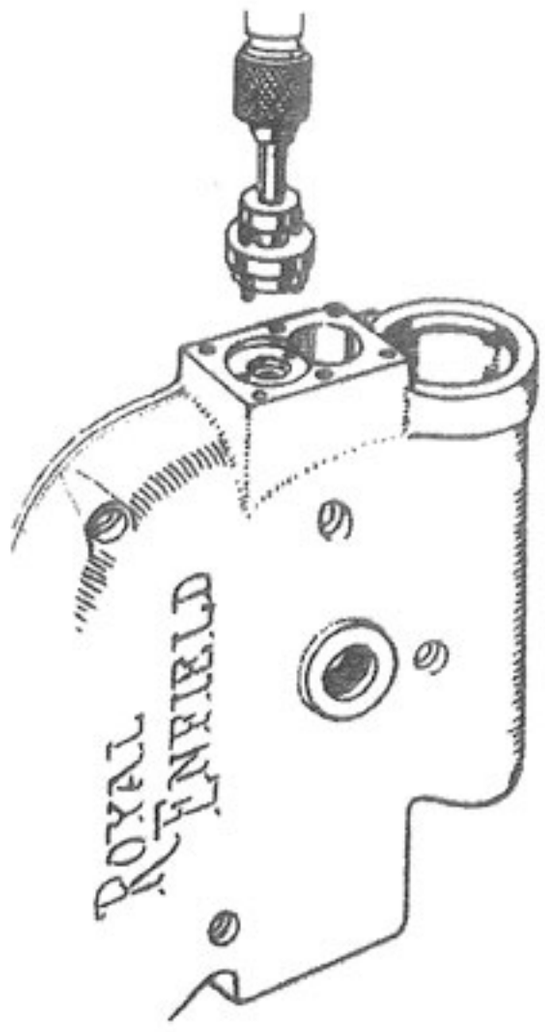
E.4877
ENGINE SPROCKET NUT SPANNER



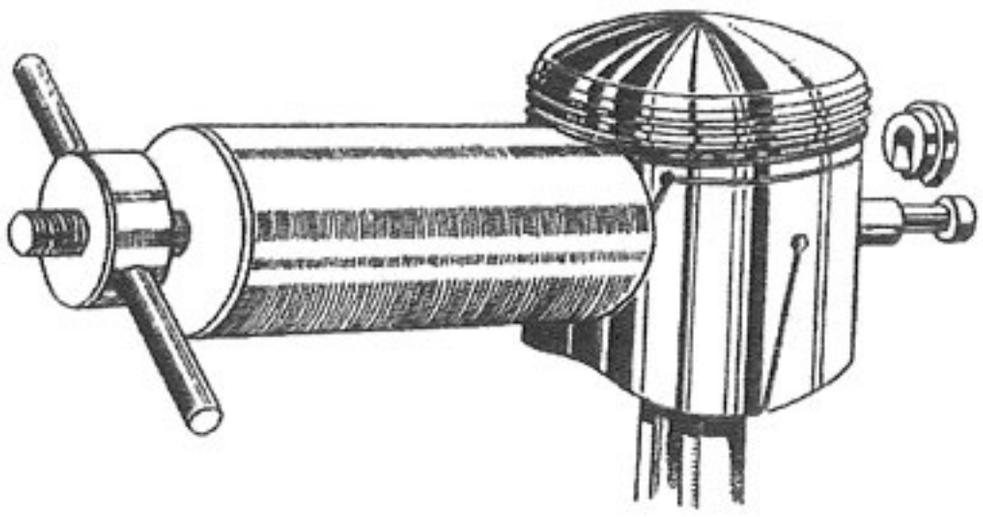
E.5121
CRANKSHAFT EXTRACTOR



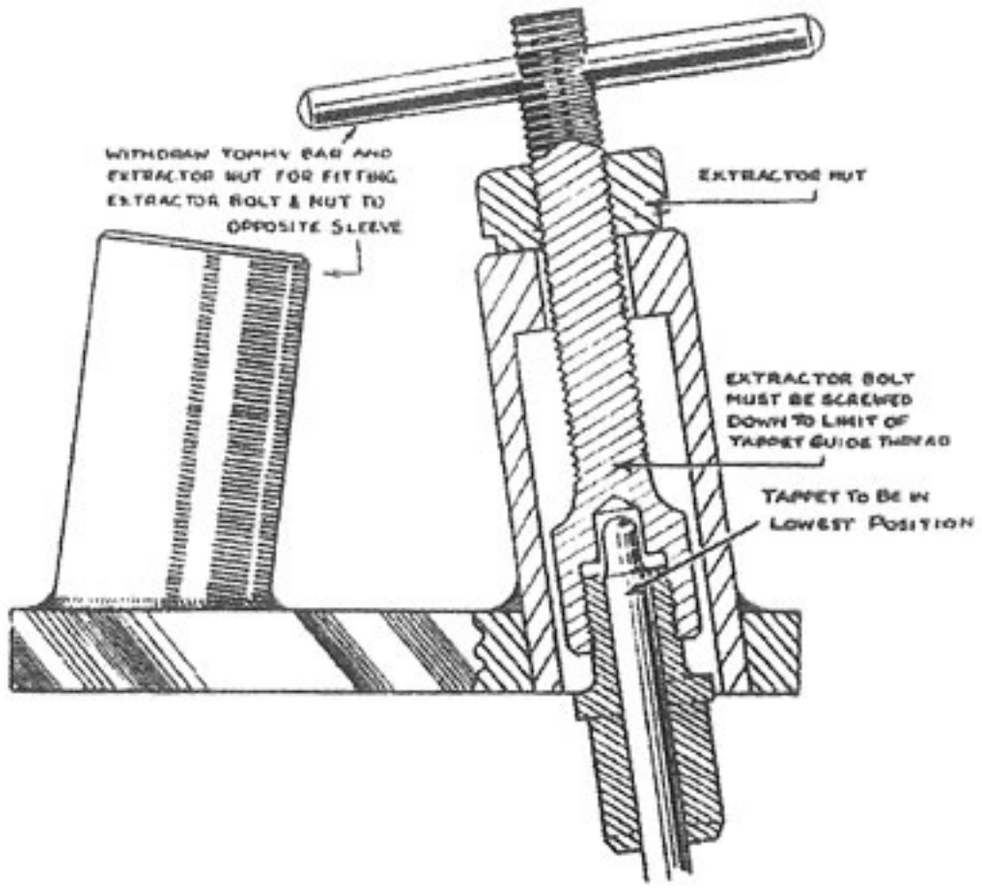
E.5414
CLUTCH HUB EXTRACTOR



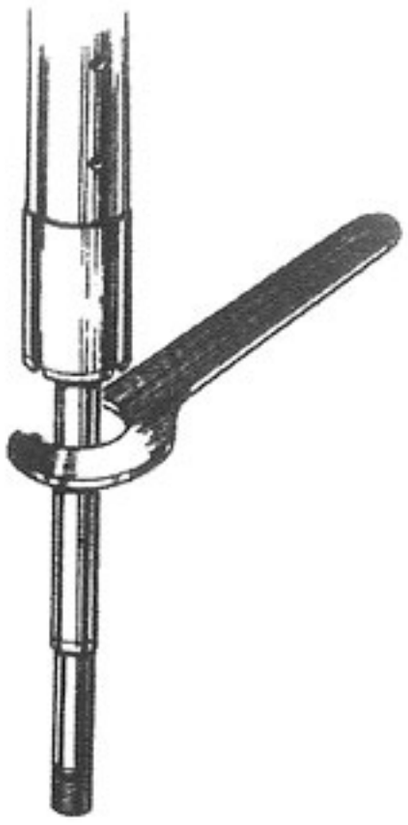
E.5425
PUMP DISC LAPPING TOOL



E.5477
GUDGEON PIN EXTRACTOR

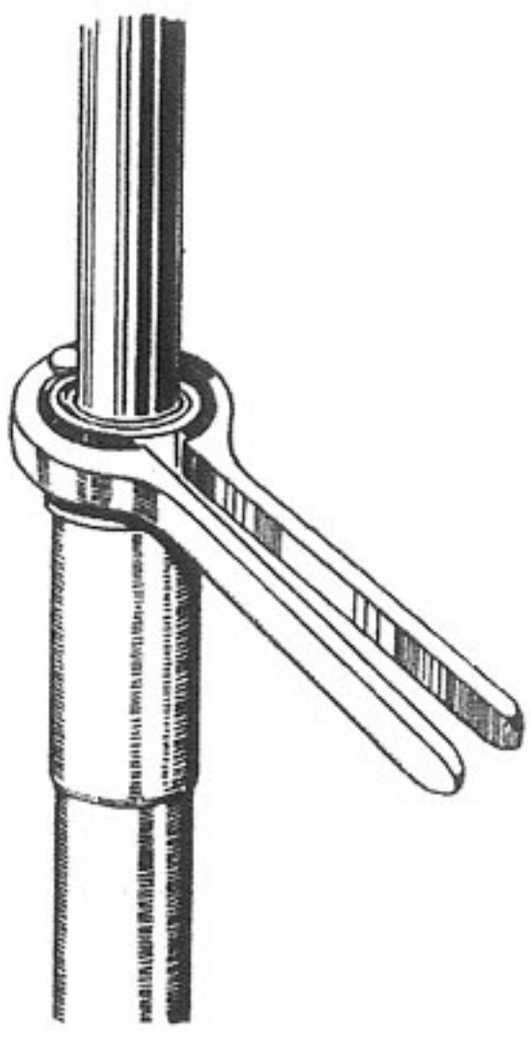


E.5790
TAPPET GUIDE EXTRACTOR

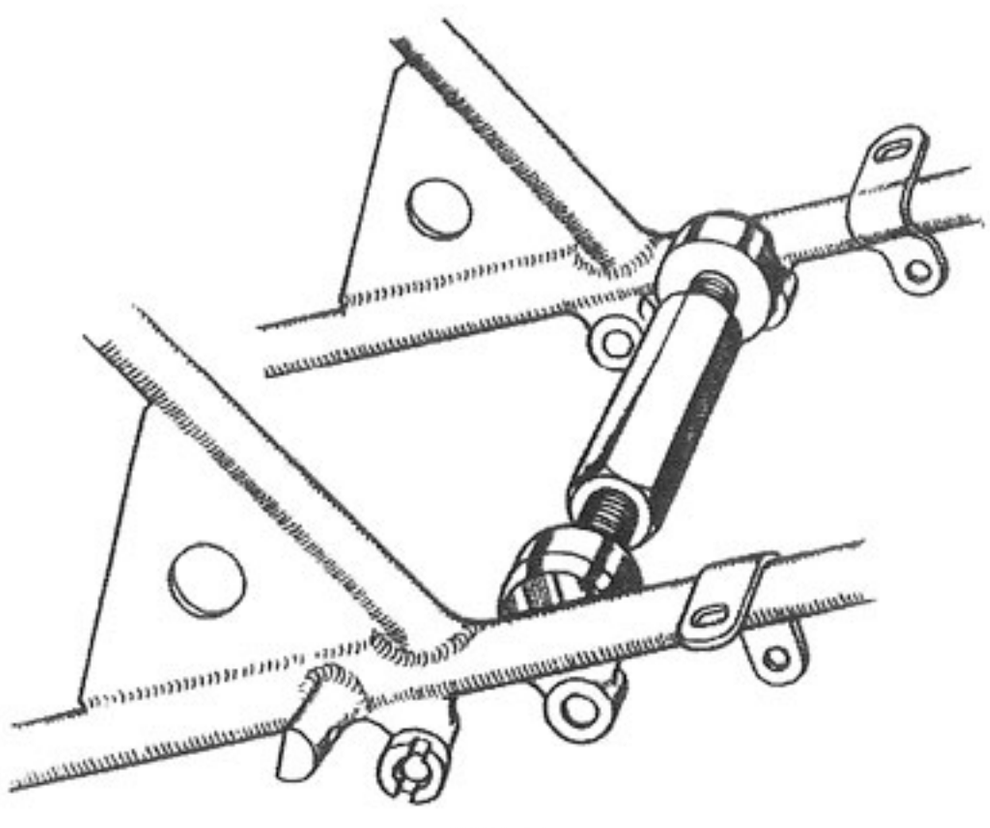


E.5418
LOCKRING SPANNER

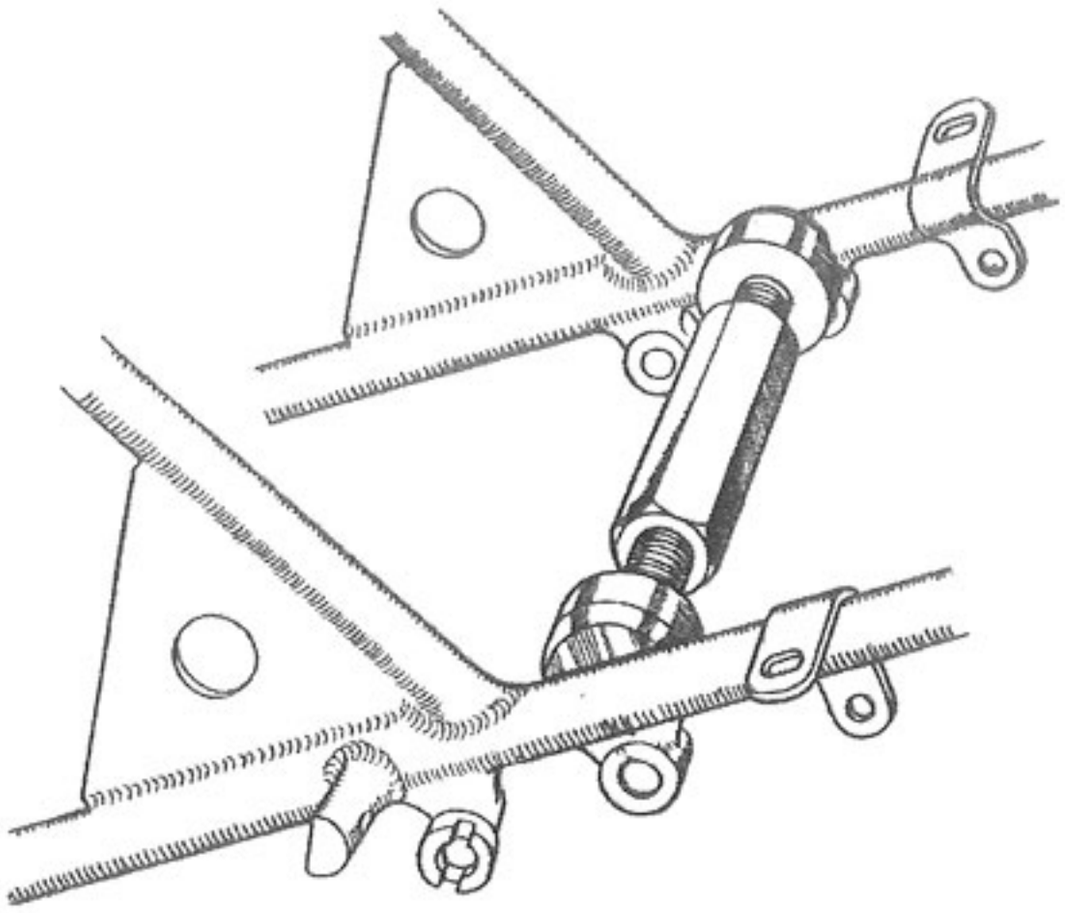
14835
MAGDYNO PINION EXTRACTOR



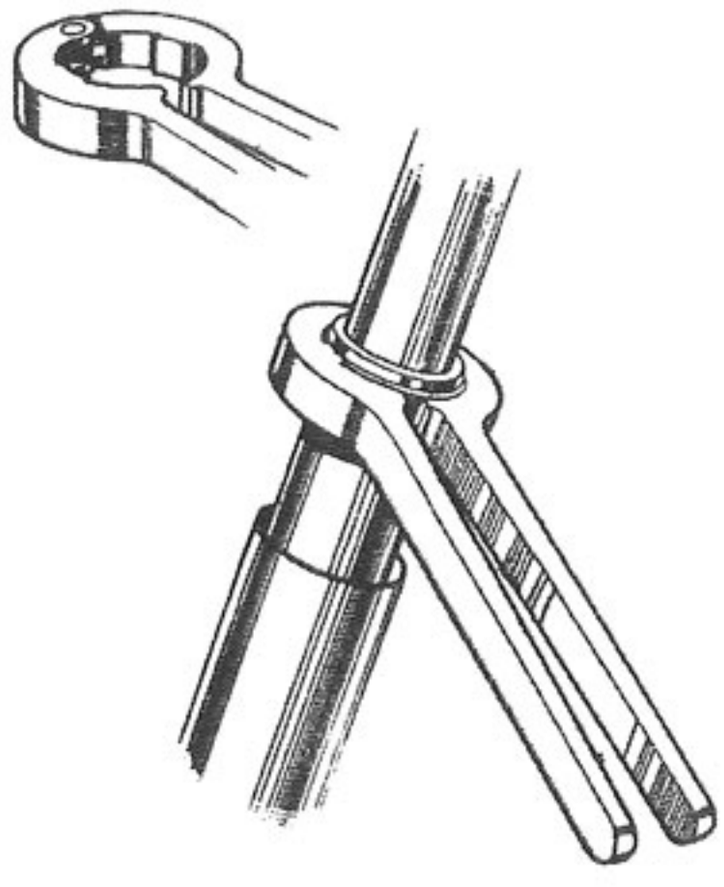
E.4912
GLAND NUT AND OUTER TUBE
HAND GRIPS



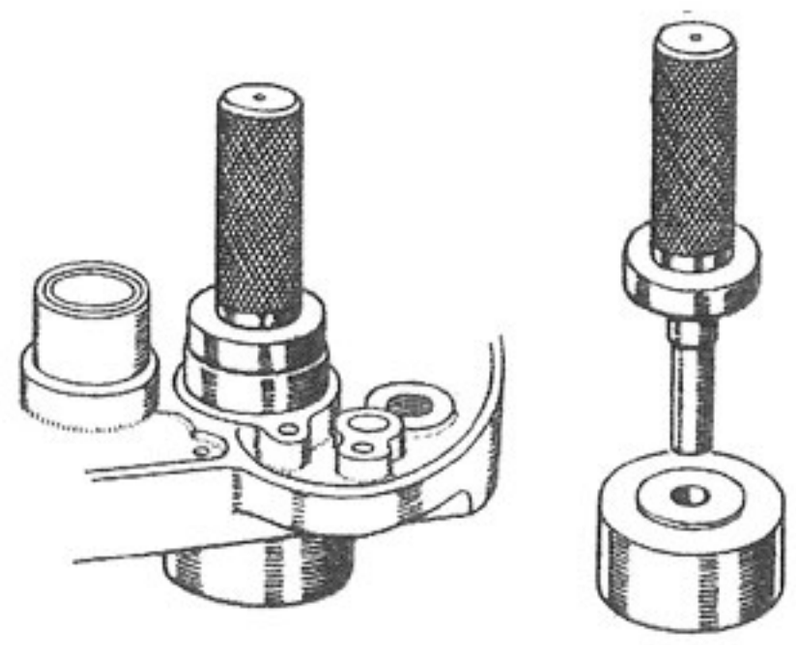
E.5431
FRAME EXPANDER



E.5431
FRAME EXPANDER



E.5417
GLAND NUT HAND GRIPS



E.4823
GEARBOX COVER BALL BEARING