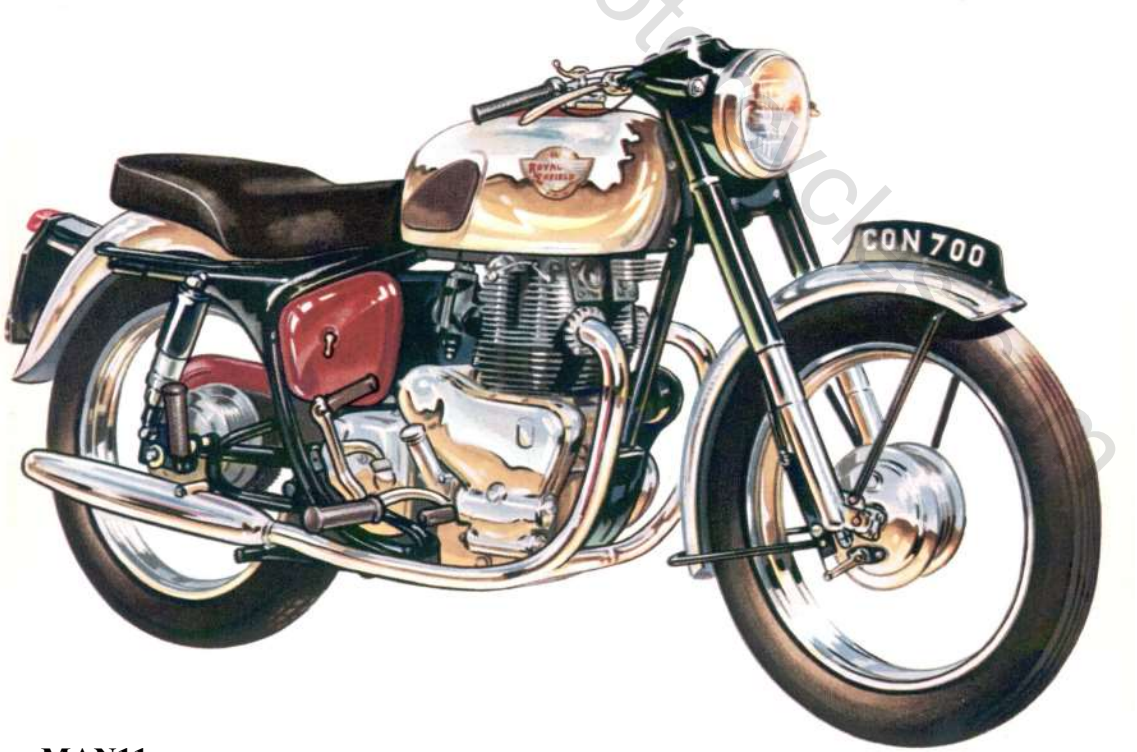
WORKSHOP
MAINTENANCE MANUAL
FOR THE

Royal Enfield

CONSTELLATION 1958 on
SUPER METEOR 1956 on



MAN11

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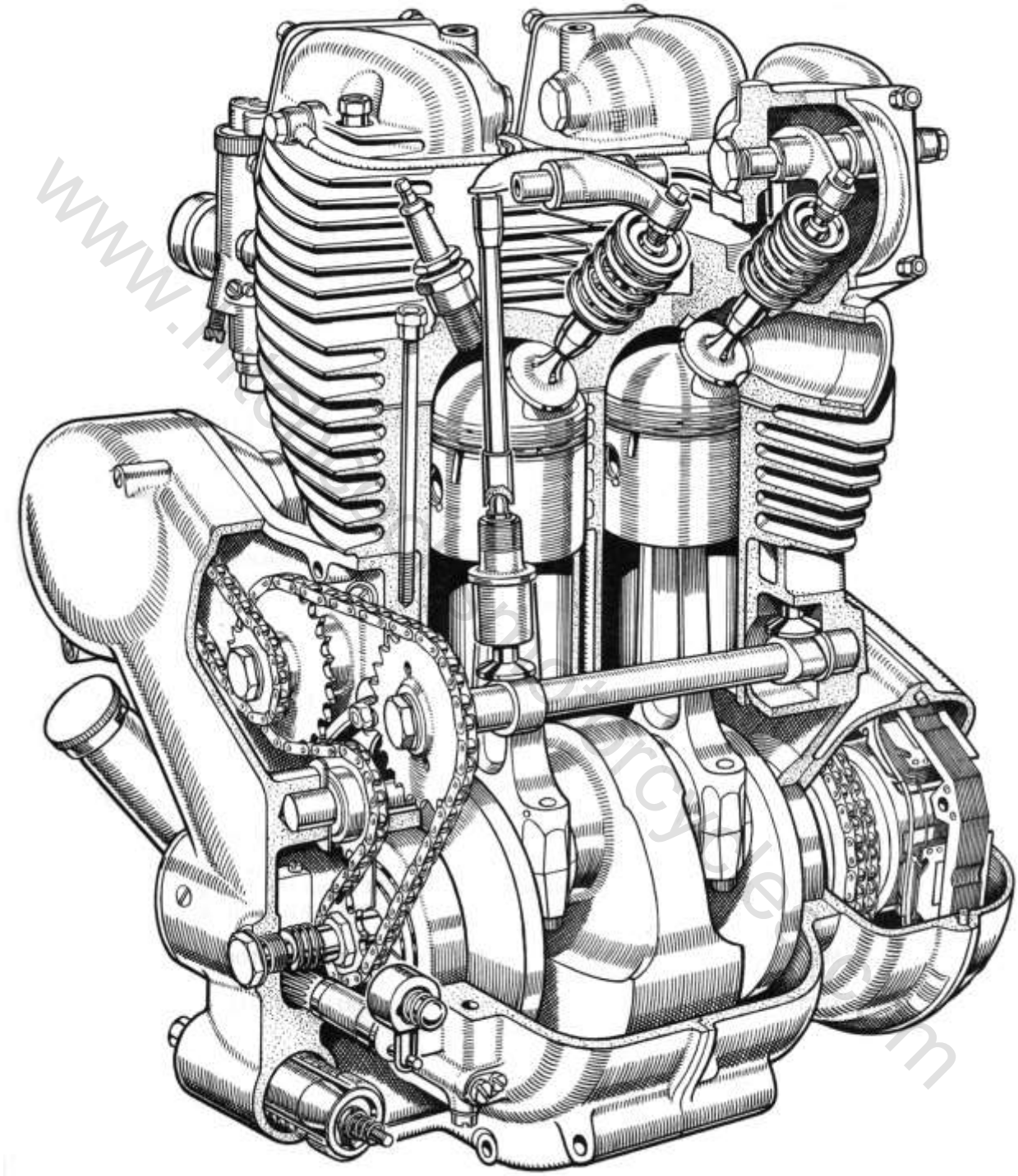


SECTIONAL VIEW OF TYPICAL TWIN CYLINDER ENGINE (EARLY TYPE)

SECTION A4

Technical Data
Super Meteor 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 ..... 7.1/4 to 1
Piston Diameter-
Bottom of Skirt-
Fore and Aft. 69.811 m.m.
Top Lands 69.40/69.35 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 ..... 2.0190/2.0185 in.
Bearing Shell Internal Diameter 1.8760/1.8755in.
Crank Pin Diameter ..... 1.8750/1.8745in.

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 (early) 1.1/2 in. (late)
Outer 2.3/32 (early) 1.11/16 in. (late)
(Renew when reduced by 3/16 in. early or 1/16 in. late)
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.

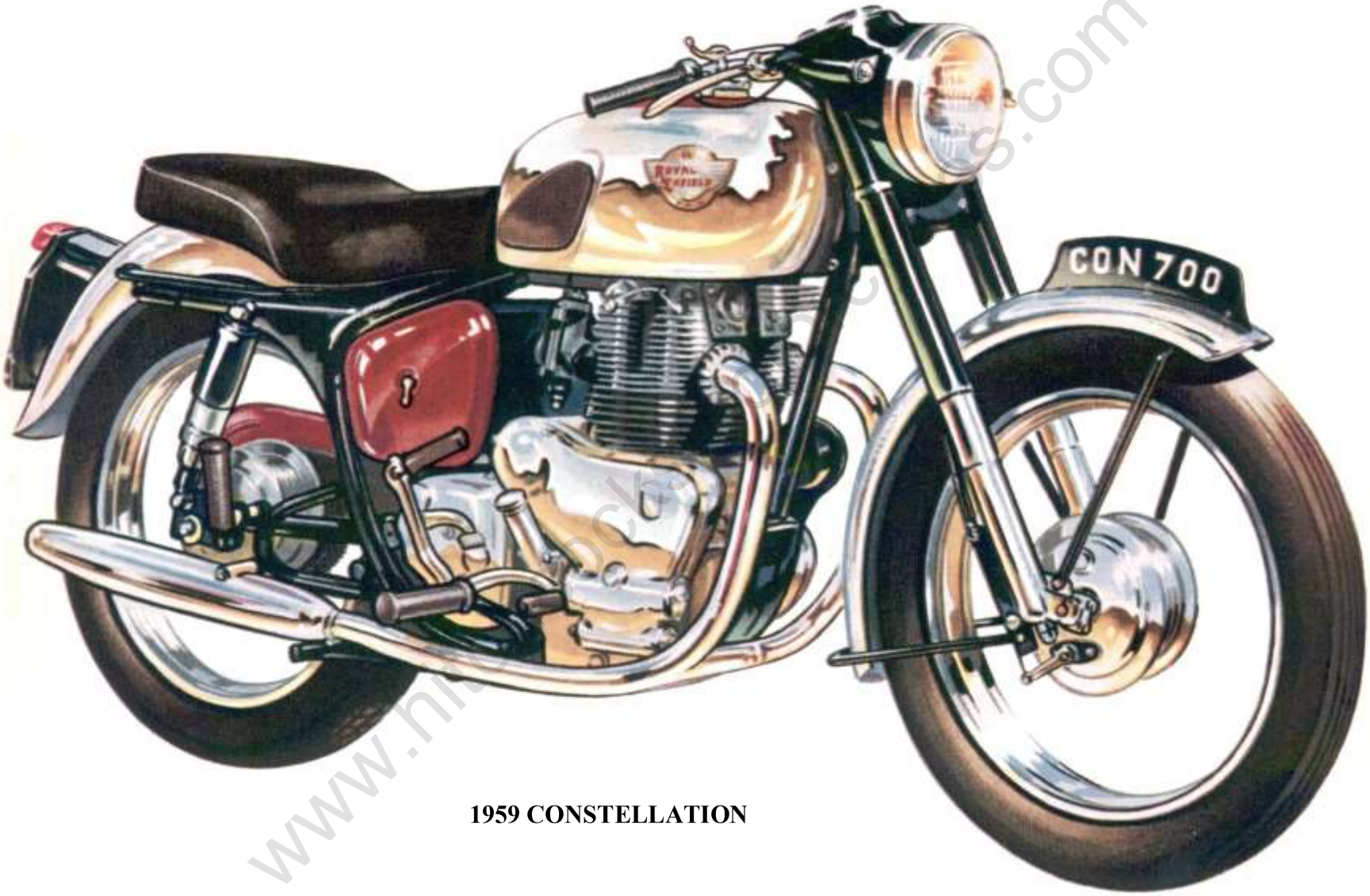
Magneto Speed ..... Half Engine Speed
Points ..... 015 in.
Timing Advanced 3/8 in.-7/16 in. before T.D.C.
Timing Retarded 1/32 in. before T.D.C.

Engine Sprocket (33t Early) 29 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 early) 92 pitches
Width ..... .628 in.
Pitch ..... .375 in.
Roller ..... .250 in.
Feed Oil Pump-Speed ..... 1/6 Engine Speed
Piston Diameter .24975/.24950 in.
Stroke ..... .5 in.

Return Oil Pump-Speed .. 1/6 Engine Speed.
Piston Diameter .375.3755 in.
Stroke ..... .5 in.

Spark Plug: Early type
(short reach) Champion L5 or L11S

Late type
(long reach) Champion N3 or NA10



1959 CONSTELLATION

SECTION A11

Technical Data
Constellation Engine

Cubic Capacity ..... 692 c.c.
Stroke ..... 90 m.m.
Bore ..... Nominal 70 m.m.
Actual 69.877 m.m./2.752 in.
(Rebore to .020 in. when wear exceeds .0065 in. and again to .040 in. after further .0065 in. wear).

Compression Ratio ..... 8 to 1
Piston Diameter-
Bottom of Skirt-
Fore and Aft. 69.811 m.m.
Top Lands (later type) 69.31/69.26 m.m.
Top Lands (early type) 69.40/69.35 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 ..... 2.0190/2.0185 in.
Bearing Shell Internal Diameter 1.8760/1.8755in.
Crank Pin Diameter ..... 1.8750/1.8745in.

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
For continuous high speed running set Exhaust tappet to .005 in. clearance

Valve Spring Free Length
Inner ..... 1.1/2 in.
Outer ..... 1.11/16 in.
(Renew when reduced by 1/16 in.)
Valve Timing with .012 in. clearance--
Exhaust Opens ... 83° before B.D.C.
Exhaust Closes ... 35° after T.D.C.
Inlet Opens ... ... 24° before T.D.C.
Inlet Closes ... ... 73° 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 Exhaust ..... .3280 in.
Inlet ..... .3440 in.
Valve Lift Exhaust (approx.). ... .3280 in.
Inlet (approx.) ..... .3440 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.

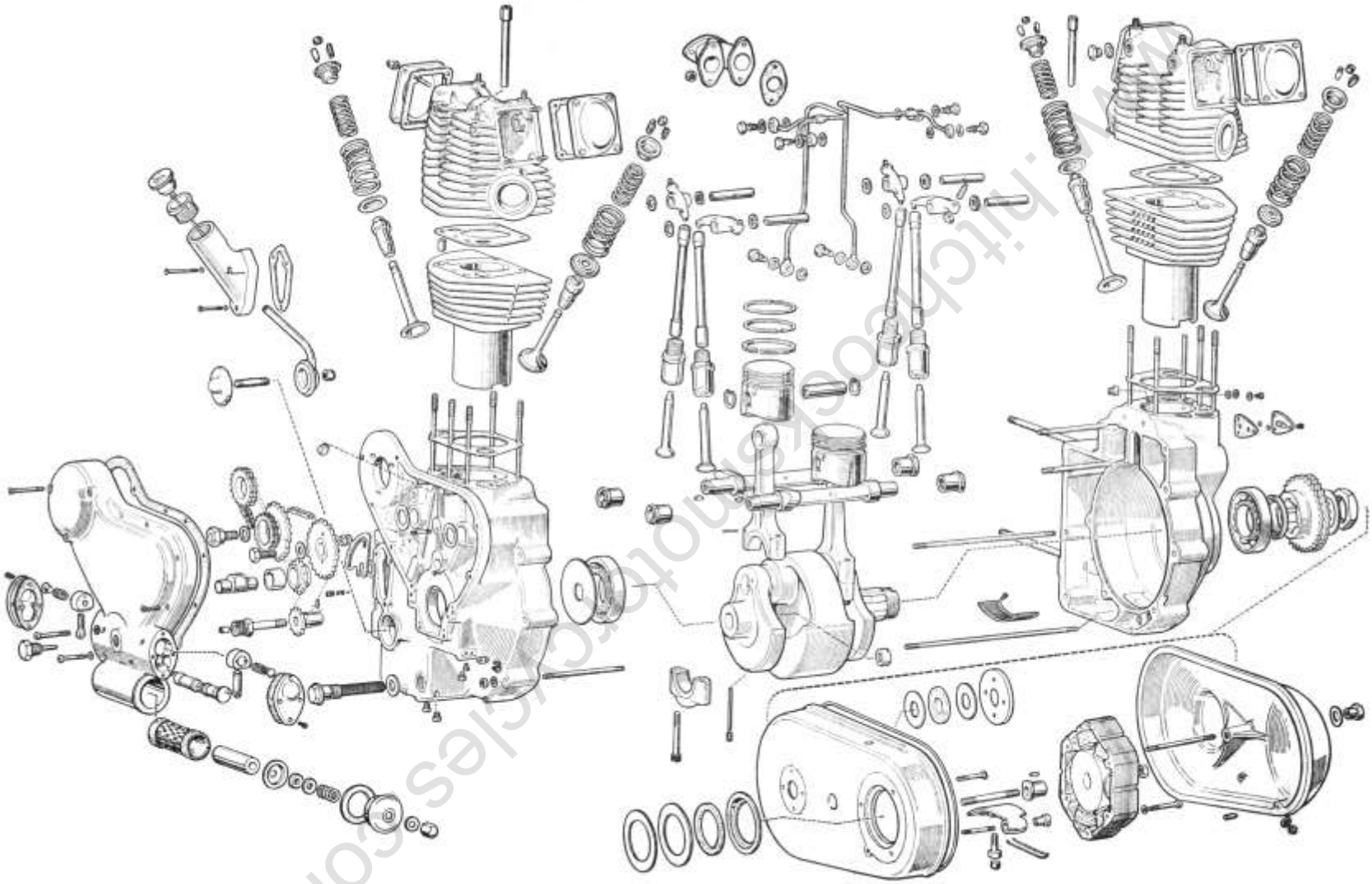
Magneto Speed ..... Half Engine Speed
Points ..... 015 in.
Timing Advanced 3/8 in.-7/16 in. before T.D.C.
Timing Retarded 1/32 in. before T.D.C.

Engine Sprocket ..... 29 Teeth
Clutch Sprocket ..... 56 Teeth
Final Drive Sprocket (Solo) ..... 20 Teeth
Primary Chain Type Duplex No. 114038 endless
Length ..... 92 pitches
Width ..... .628 in.
Pitch ..... .375 in.
Roller ..... .250 in.
Feed Oil Pump-Speed ..... 1/6 Engine Speed
Piston Diameter .24975/.24950 in.
Stroke ..... .5 in.

Return Oil Pump-Speed .. 1/6 Engine Speed.
Piston Diameter .375.3755 in.
Stroke ..... .5 in.

Spark Plug: Engine numbers SMSA 6751 - 6795 (short reach) Champion L5 or L11S

Engine numbers SMSA 6796 onwards (long reach) Champion N3 or NA10



EXPLODED VIEW OF "SUPER METEOR" ENGINE
Fig. 1

SECTION B4

Engine Specification
" Super Meteor "

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 streamlined and blended to the valve seatings.

3. Cylinders

The separate cast iron cylinders have a nominal bore of 70 m.m., the stroke being 90 m.m. The cubic capacity of the engine is 692 c.c. The cylinder heads are located on the cylinders by hollow dowels.

4. Pistons

The high compression pistons are of low expansion aluminium alloy, heat treated and form-turned oval and having split skirts. The compression ratio is 7¼ to 1. There are three piston rings, the top two of which are compression rings. Both are taper ground and the top one is chromium plated. The third ring is for oil control and is slotted.

5. Connecting Rods

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

The big end bearings are of alloy direct to the crankshaft. The detachable bearing caps are bolted to the connecting rods by means of high tensile socket screws, secured by cotter pins.

6. Crankcase

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

7. Crankshaft and Flywheel

The crankshaft is cast in one piece, integral with the massive central flywheel, from high quality meehanite cast iron. The total weight is 26lbs. 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

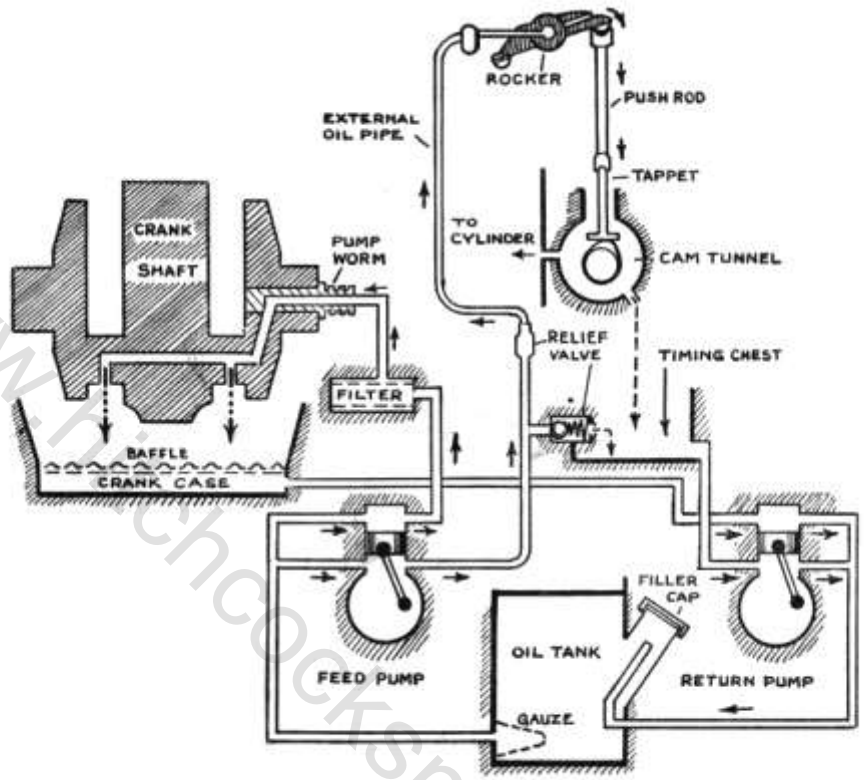
The inlet valves are machined from stampings of special Silicon-Chrome Valve Steel and the exhaust valves are of austenitic steel.

11. Valve Gear

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

12. Timing Drive

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



"SUPER METEOR" LUBRICATION SYSTEM. Diagrammatic Arrangement

Fig. 2

The magneto 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. (See Section G)

Separate systems are provided for ignition and lighting. The former is by the latest type of Lucas brushless Magneto with rotating magnet and stationary contact breaker. The magneto runs at half engine speed and has a built-in distributor and double cam.

Lighting current is supplied by the battery which is charged through a rectifier from an alternator consisting of a rotating magnet mounted on the crankshaft and running in a six-coil stator in the primary chaincase.

14. Carburettor. (See Section F2)

Amal Monobloc Type 376/41 Bore 1 1/16in.

Main Jet	240
Needle Jet	.....Standard
Pilot Jet	.....30 c.c.
Throttle Valve	.....No. 3½
Needle Position	.....No. 3
Pilot Outlet	.....025 in.

15. Air Filter

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

16. Lubrication System

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

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

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

The oil from the rocker bearings is squirted through a small hole in the rocker on to the top

end of the pushrod. 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.

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

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

17. Breather

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

The breather is located on the driving side of the crankcase and consists of a small housing attached to the crankcase by three screws and having a short rubber tube with flattened end, which acts as a non-return valve.

On some models the housing contains two pen-steel discs covering two holes drilled in the crankcase. Accurate seating of the discs is ensured by a pen-steel plate held between the breather body and the crankcase.

18. Gearbox

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

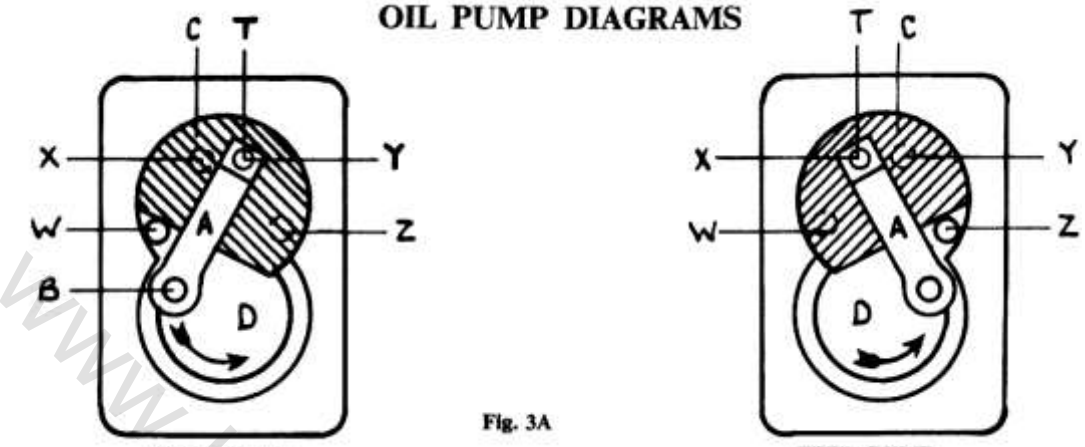
The standard gear ratios are as follows :-

	Solo	**Sidecar**
Bottom Gear	12.05	13.55
Second Gear	7.87	8.85
Third Gear	5.63	6.34
Top Gear	4.33	4.88

19. Clutch

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 Klinger inserts which give smooth operation and freedom from slipping in the presence of oil.

OIL PUMP DIAGRAMS



FEED PUMP POSITION 1

Fig. 3A

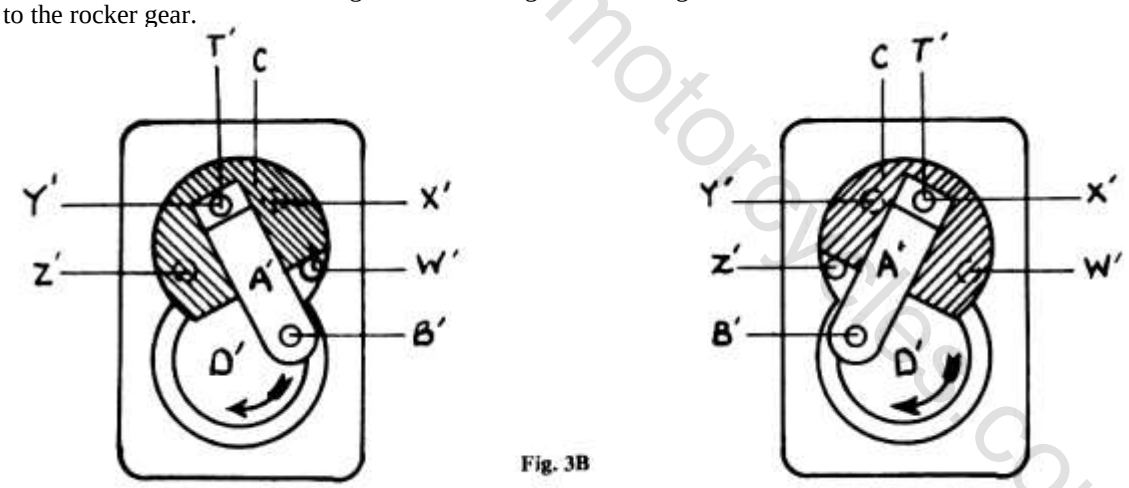
FEED PUMP POSITION 2

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

Fig. 3B

RETURN PUMP POSITION 2

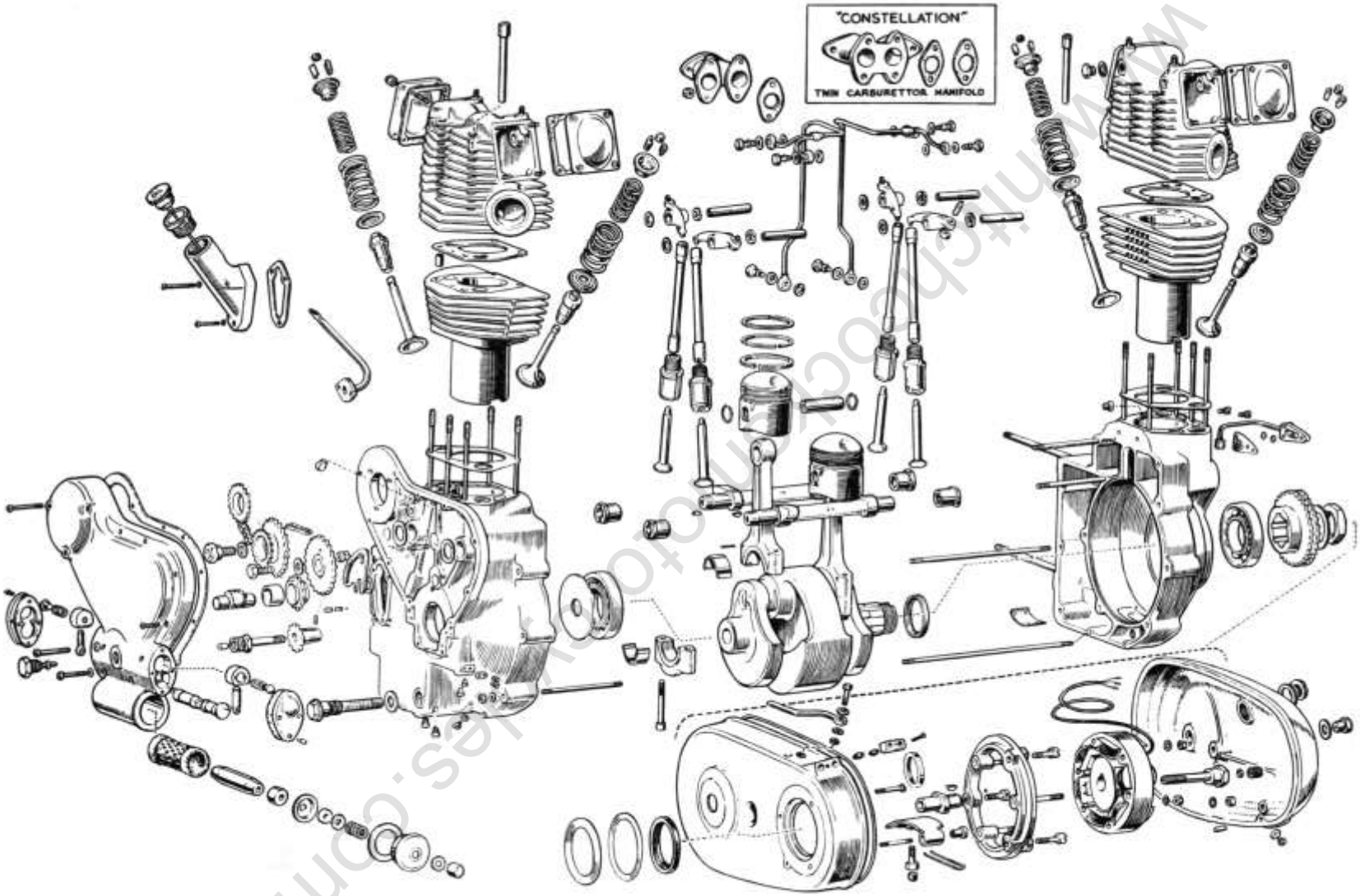
The ports in the housing are connected as follows :

W' - delivery to oil tank. Y' - suction from crankcase.
X' - delivery to oil tank. Z' - suction from timing chest.

Position 1. The plunger A' is being drawn out of the cylinder hole in the disc C' by the action of the peg B' on the shaft D'. The port T' in the disc C' registers with the suction port Y' in the housing, so that oil is drawn into the cylinder from the crankcase sump. At the same time the delivery port W' in the housing is uncovered and oil below the disc in the housing is forced through W' back to the oil tank.

Position 2. The plunger A' is being pushed into the cylinder hole in the disc C'. The port T' in the disc now registers with the delivery port X' in the housing, so that oil is forced out of the cylinder back to the oil tank. At the same time the suction port Z' in the housing is uncovered and oil is drawn into the housing below the disc from the timing chest.

1956 SUPER METEOR



EXPLODED VIEW OF TYPICAL TWIN CYLINDER ENGINE (LATER TYPE)
Fig. 1

SECTION B11

Engine Specification

"Constellation"

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.

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.

The cylinder heads are located on the cylinders by hollow dowels.

4. Pistons

The pistons are of low expansion aluminium alloy, heat-treated and form-turned oval. The compression ratio is 8 to 1.

Early models have three piston rings, the top two being compression rings, the bottom one a single slotted scraper. Later models have pistons of lighter weight than earlier types, and whilst retaining similar compression rings, the bottom piston ring groove contains 2 separate oil control rings (see Fig. 7, section C). All compression rings are taper ground, the top one being chromium plated.

5. Connecting -Rods

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

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

6. Crankcase

The combined crankcase and oil tank 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 spheroidal graphitic cast iron. The total weight is 24 lbs. and except in some earlier engines the crankshafts are dynamically balanced.

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

8. Main Bearings

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

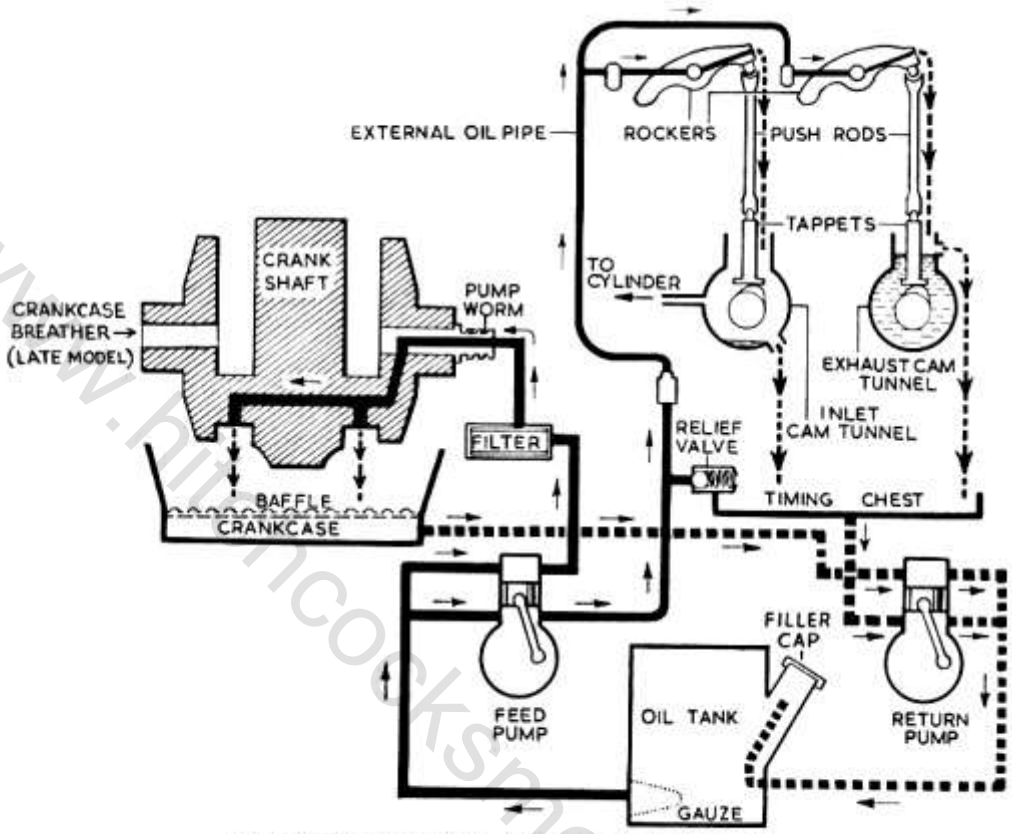
9. Camshafts

The camshafts are machined from drop-forged steel stampings with the cams and bearings hardened and ground. The cam profiles are produced to give racing performance and, in order to obtain the maximum efficiency, the usual silencing ramps are omitted.

The camshafts are located in the crankcase and run in bronze bushes. The bushes on the near side are pressed into detachable housings which are bolted to the driving side crankcase. This enables the camshafts to be changed, if so desired for tuning purposes, without the necessity of dismantling the crankcases.

10. Valves

The inlet valves are machined from stampings of special Silicon-Chrome Valve Steel and the exhaust valves are of High Nickel-Chromium Tungsten valve Steel with the stems stellite-faced.



LUBRICATION SYSTEM. Diagrammatic Arrangement
Fig. 2

11. Valve Gear

The valves are operated from the camshaft by means of large, flat-based, guided tappets, tubular alloy push rods with induction hardened steel ends and overhead rockers. Two compression springs are fitted to each valve secured by Bullock Type split collets locking in Timinium collars. The springs are specially designed to give a variable rate on compression.

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 magneto 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.

A special slotted bolt securing the front camshaft sprocket provides a drive to a tachometer if this is required. This drive can be fixed to an aperture provided in the timing cover, which is otherwise covered by a small plate.

13. Ignition and Lighting System (See Section G)

The ignition is supplied from a Lucas K2F magneto and the lighting and other electrical circuits from a 6-volt battery which is charged through a rectifier from a Lucas alternator.

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

The magneto is chain-driven from the inlet camshaft at half engine speed and the timing is hand controlled from a lever on the handlebar.

14. Single Carburettor (see Section F)

The carburettor is an Amal Type Tl0.TT9, with a bore of 1.3/16 inches.

For very high speeds it is essential to have an independent float chamber flexibly mounted as near the centre-line of the machine as possible.

There is, however, a tendency to flood, and for normal use a conventional float chamber fixed to the carburetter is more satisfactory.

Main Jet 480
Needle Jet 109
Throttle Valve ... ... No. 5
Needle Clip in third groove from top.

Twin Carburetters (see Section F)

Both carburetters are identical in all respects but for the float chamber arrangement, which is as follows

Carburettor type 376/242 supplies the left-hand cylinder, and has an integral float chamber which also controls the fuel supply via a connecting pipe to the right hand instrument type 376/243. This does not have a float chamber in unit with it.

Main Jet 320
Needle Jet 106
Throttle Valve 376/4
Pilot Jet ..... 25 c.c.
Needle Position 3

15. Air Filter

Provision is made for housing a 5 in. diameter Vokes Micre-Vee felt and gauze dry filter in a compartment of the toolbox, but the use of this may reduce the maximum speed slightly.

Owing to the positions of the twin carburettors in relation to the toolbox, it is not possible to attach air filters in this instance.

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 and is prevented by a baffle from being drawn up by the flywheel.

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

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

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

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

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

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

17. Breather

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

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

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

In addition a breather, in the form of a pen-steel disc, is situated in a recess in the head of the special bolt, which secures the alternator rotor on to the end of the crankshaft. This bolt is drilled throughout its length, and communicates

crankcase pressure to the breather via the hole drilled through the drive side main journal.

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

A vent pipe fitted to the top of the primary chain case has its aperture inside the case shielded by a baffle from oil flung from the chain. (See Fig. 8, Section C.)

18. Gearbox

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

The standard gear ratios are as follows :-

Bottom Gear	.....12.35
Second Gear	.....8.16
Third Gear	.....6.04
Top Gear	.....4.44

19. Clutch

The clutch has five pressure plates and four friction plates, including the sprocket which is lined on both sides with friction material. The other friction plates have all Klingerite inserts on early models.

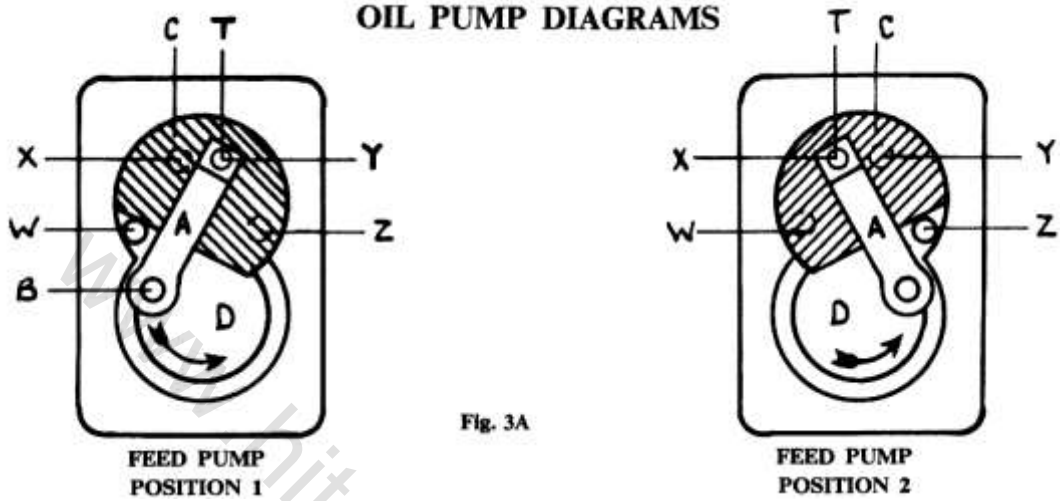
Later models employ a different friction material on the friction plate which is first in order of assembly, to the following two plates. These have a friction material of a corky texture.

This assembly gives smooth operation, and eliminates clutch slip under the most arduous conditions.

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

A description of the operating mechanism is given in Section E, Sub-section 1.

OIL PUMP DIAGRAMS



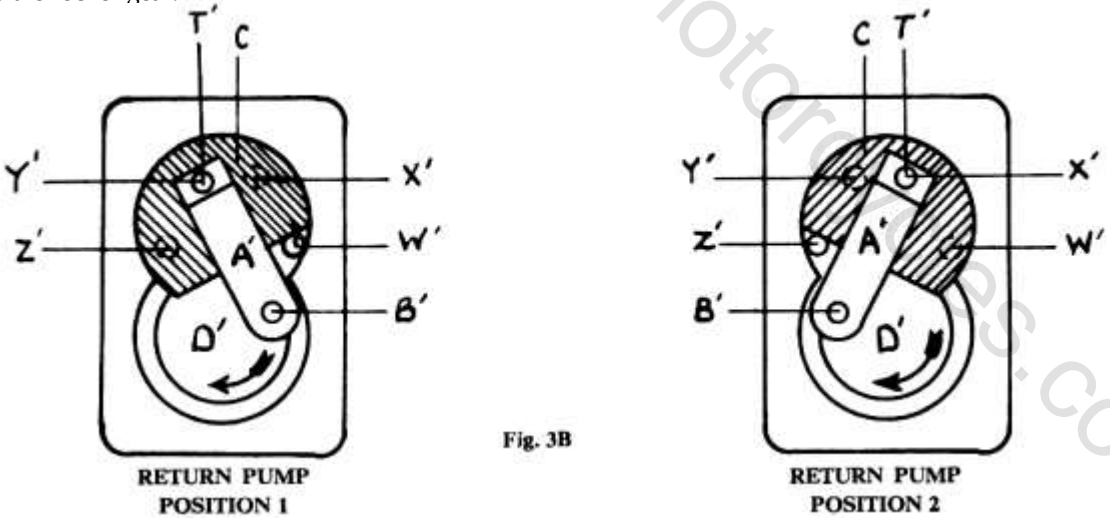
FEED PUMP POSITION 1 — Fig. 3A — FEED PUMP POSITION 2

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.



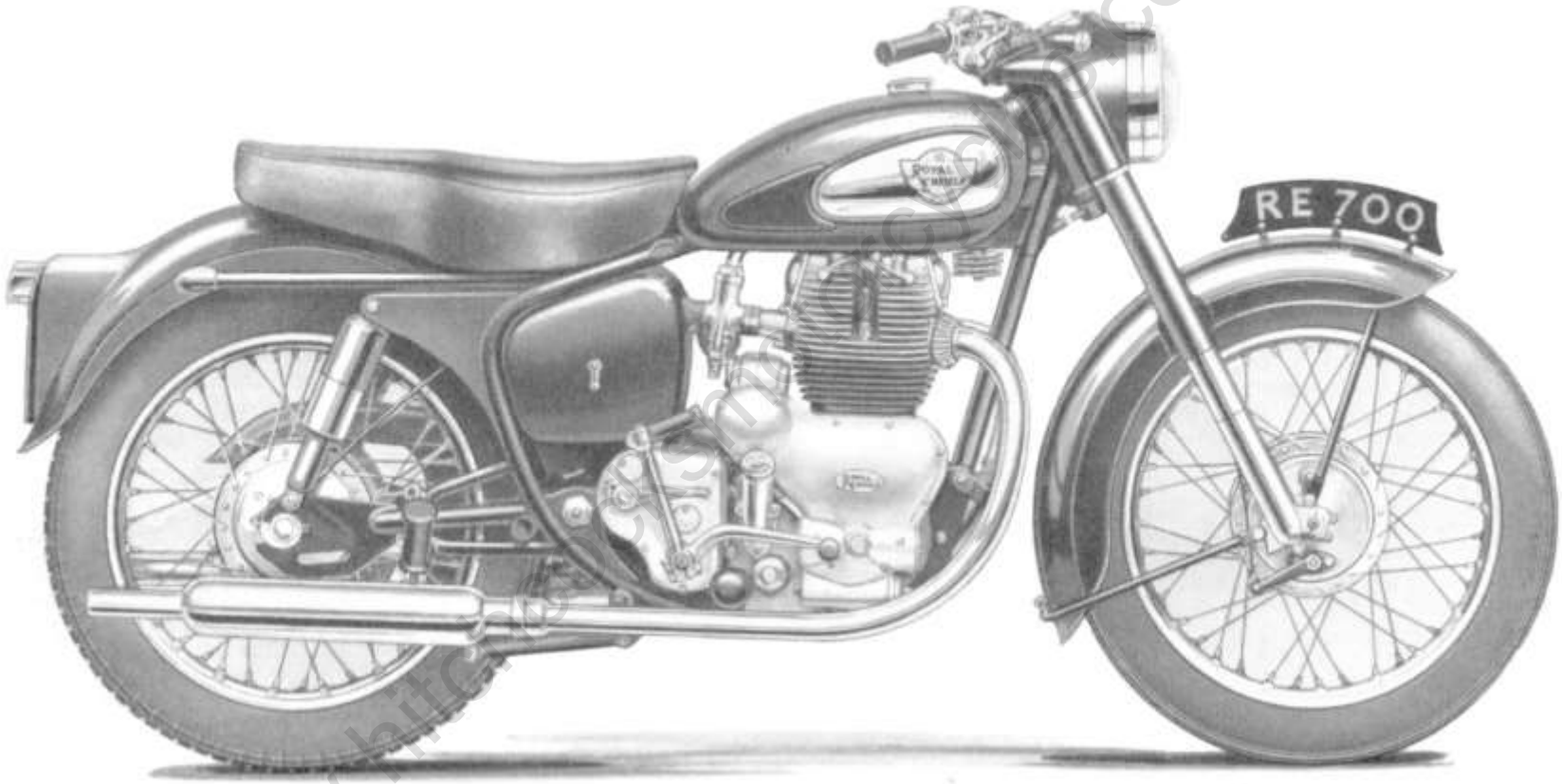
RETURN PUMP POSITION 1 — Fig. 3B — RETURN PUMP POSITION 2

The ports in the housing are connected as follows :

W' - delivery to oil tank. Y' - suction from crankcase.
X' - delivery to oil tank. Z' - suction from timing chest.

Position 1. The plunger A' is being drawn out of the cylinder hole in the disc C' by the action of the peg B' on the shaft D'. The port T' in the disc C' registers with the suction port Y' in the housing, so that oil is drawn into the cylinder from the crankcase sump. At the same time the delivery port W' in the housing is uncovered and oil below the disc in the housing is forced through W' back to the oil tank.

Position 2. The plunger A' is being pushed into the cylinder hole in the disc C'. The port T' in the disc now registers with the delivery port X' in the housing, so that oil is forced out of the cylinder back to the oil tank. At the same time the suction port Z' in the housing is uncovered and oil is drawn into the housing below the disc from the timing chest.



1957 SUPER METEOR

SECTION C4

Service Operations with Engine in Frame

"Super Meteor"

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 neoprene seal is in position on the oil feed plug. If the seal is split or otherwise damaged, a new one should be fitted, of the latest type, which is captive on the feed plug. The feed plug is Part No. 42113 and the seal is Part No. 42114. If the plug is damaged it should be renewed to ensure oil pressure to the big end bearings.

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

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

To verify that the oil pumps are working after replacing the timing cover, start the engine and remove the oil filler cap so that the oil return pipe can be seen. It may take several minutes for all the oil passages to fill and the oil to commence to circulate.

2. Valve Timing

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

The correct setting is obtained with the marks stamped on the camshaft sprockets facing each other inwards on the centre line and the mark on the crankshaft sprockets pointing vertically downwards. 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 the rocker. Access to the adjusting screws is obtained by removing the covers of the rocker boxes.

The clearance between the end of the screw 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 are found to be worn, they should be renewed, as uneven thrust due to the screw being in a different position after adjustment may cause lateral movement of the rocker giving rise to a sharp tapping noise.

4. Ignition Timing

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

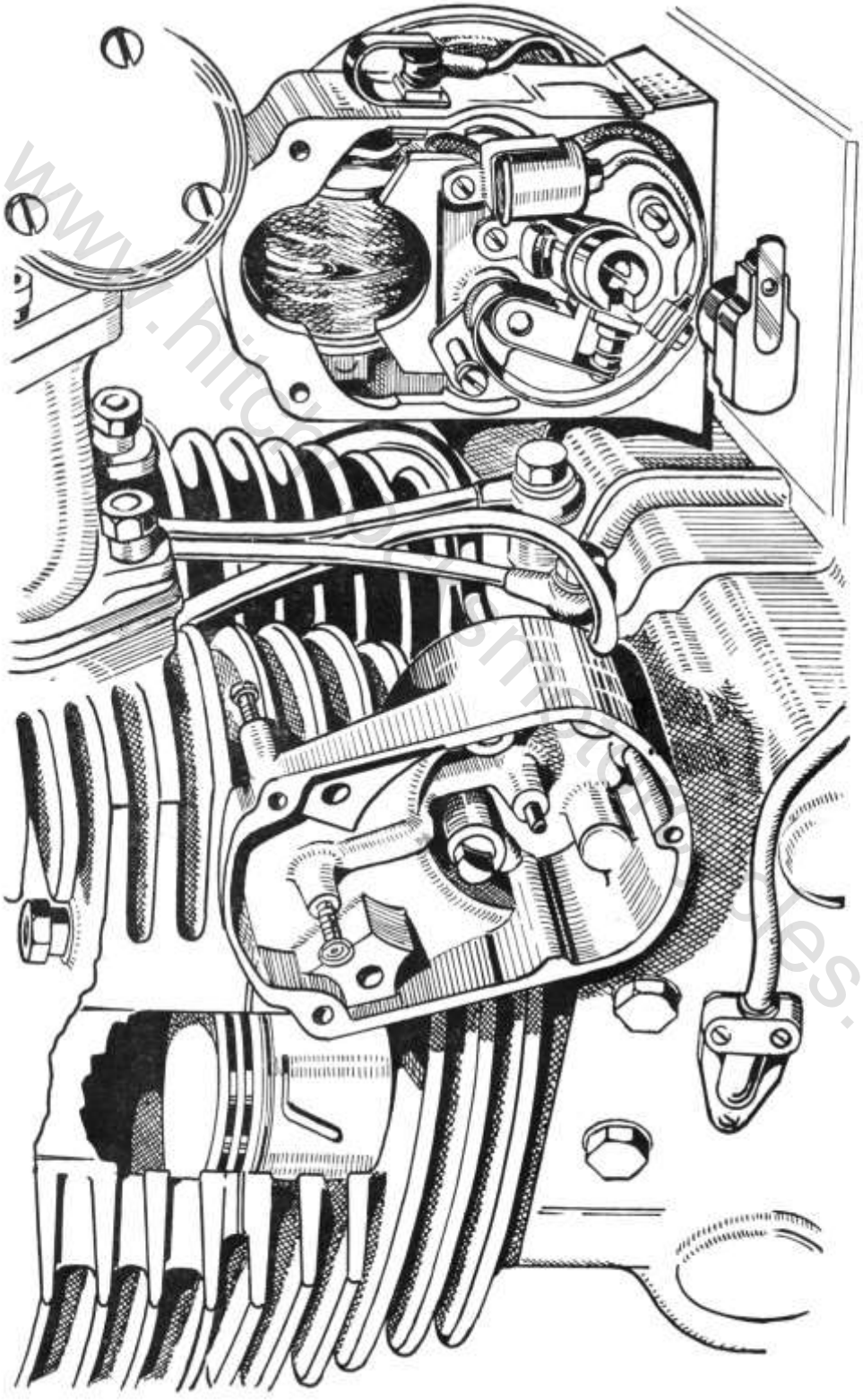
To obtain access to the magneto sprocket it is necessary to remove the timing cover (see Subsection 1).

The sprocket is built into the automatic advance device and is mounted on a smooth taper on the magneto shaft. It is held in position by a nut. **(Right Hand Thread.)**

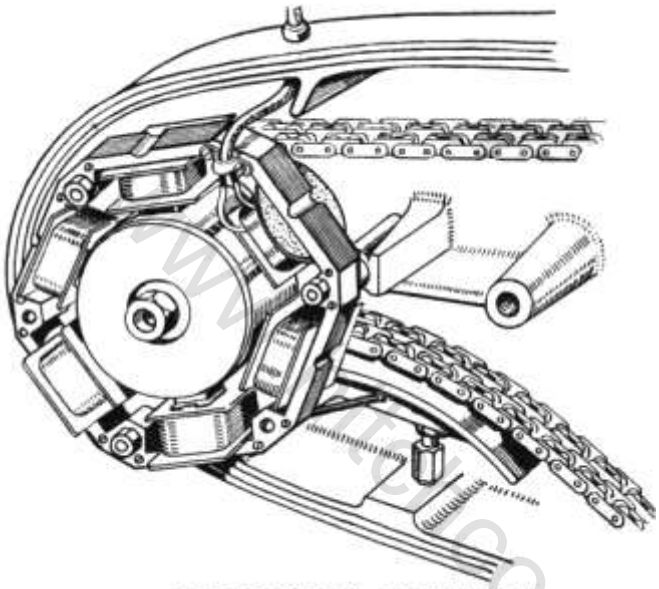
To remove the sprocket and auto-advance device, unscrew the nut and this will draw the sprocket off.

Before setting the timing remove the rotor arm of the distributor and adjust the contact breaker points to a clearance of .015 in. when fully opened.

Because of the auto-advance mechanism, the timing is normally in the "retard" position when the engine is stationary. Rotate the two



MAGNETO TIMING
Fig. 1



PRIMARY CHAIN ADJUSTMENT
Fig. 2

halves of the coupling relatively to each other against the springs, i.e. into the "advance" position, and hold it in this position with a piece of wire.

To set the timing, turn the engine until the pistons are 3/8 to 7/16 in. before top dead centre on the compression stroke of the left hand cylinder, i.e. with both valves closed.

Insert a thin piece of 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 rotor arm of the distributor when replaced will be pointing towards the segment connected to the left hand sparking plug lead.

Tighten the sprocket and auto-advance device on to the magneto shaft, taking care that it does not slip.

Remove the piece of wire holding the auto advance mechanism.

The timing can be checked by removing the cap from the magneto and holding the rotor arm of the distributor in the advanced position, which is 3/8 - 7/16 in. before top dead centre, without the necessity of taking off the timing cover.

On no account must the cam be altered from its original position on the rotor shaft or the efficiency of the magneto will be affected.

5. Primary Chain Adjustment

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

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

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

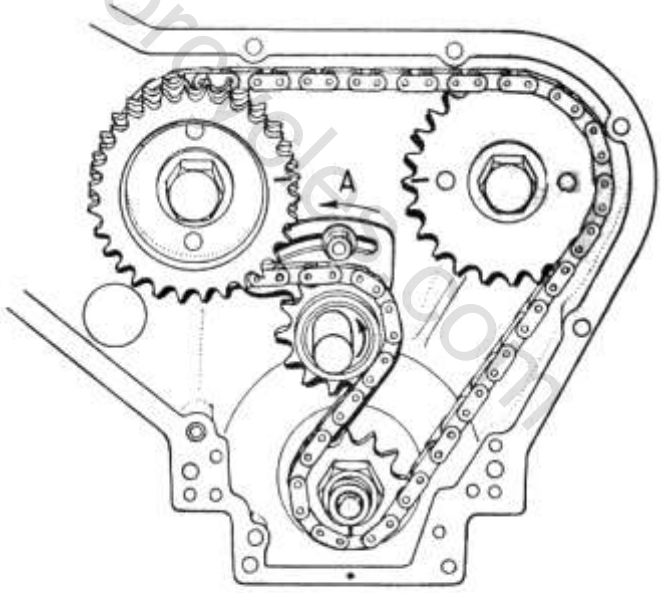
After replacing the chain cover, remember to replenish the chaincase with oil.

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 ¼ in. up and down movement at the tightest spot.

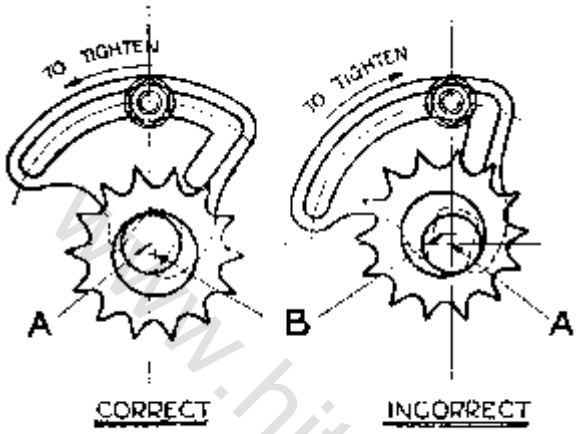
Re-tighten the locknut on the adjusting screw. Replace the chain cover and replenish with oil.

6. Timing Chain Adjustment

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.



TIMING CHAIN ADJUSTMENT SHOWING TIMING MARKS
Fig. 3



TIMING CHAIN ADJUSTMENT
Fig. 4

The tension of the timing chain is altered by moving the quadrant after slackening the nut A which secures it (see Fig. 3). This rotates the eccentric spindle on which the chain tensioner jockey sprocket is mounted. Tightening of the chain is effected by moving the quadrant to the left.

It is imperative that the quadrant is fitted the right way round and that the eccentric spindle is fitted correctly in the quadrant fork. If the chain tightens when the quadrant is moved to the right, the tensioner has been wrongly assembled and may cause damage to the quadrant (see Fig. 4).

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

If the chain is maladjusted, it may give rise to a loud noise which can be mistaken for a faulty bearing. If such a noise is heard, therefore, first check the adjustment of the timing chain.

7. Magneto Chain Adjustment

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

8. Removal of Dual Seat and Rear Mudguard

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

Remove the two nuts on either side of the seat attaching it to the frame and lift the seat and mudguard off.

9. Removal of Petrol Tank

Turn off the petrol tap.

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

10. Removal of Cylinder Head

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

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

Disconnect the head steady link.

Disconnect the oil pipes and plug lead.

Remove the exhaust pipes and carburettor and induction pipe.

Remove the rocker box covers.

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 dowels are in position in the cylinder barrel and that the push rods are the right way up (shallow cups upwards).

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

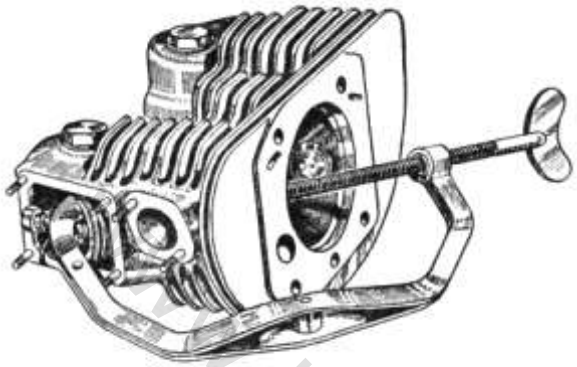
Lower the cylinder head over the push rods, making sure that the rockers locate in the push rod cups.

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 compressing tool, compress the valve springs and remove the split conical collets from the end of the valve stem. Slacken back the compressing tool and release the springs. Withdraw the valve and place its springs, top spring collar (and bottom collar if it



REMOVAL OF VALVES
Fig. 5

is loose) and split conical collets together in order that they may be re-assembled with the valve from which they were removed.

Deal similarly with the other valves in the heads.

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

12. Removal of Rockers

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

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

13. Removal of 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. If a valve guide is removed for any reason, an oversize one should be fitted in order to maintain the interference. It is necessary to re-cut the valve seat and grind in the valve after a guide has been replaced. (See Subsection 18.)

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

14. 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.

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 T.2142, consisting of a piece of 7/16 in. diameter tube or rod with a slot cut in the end is required.

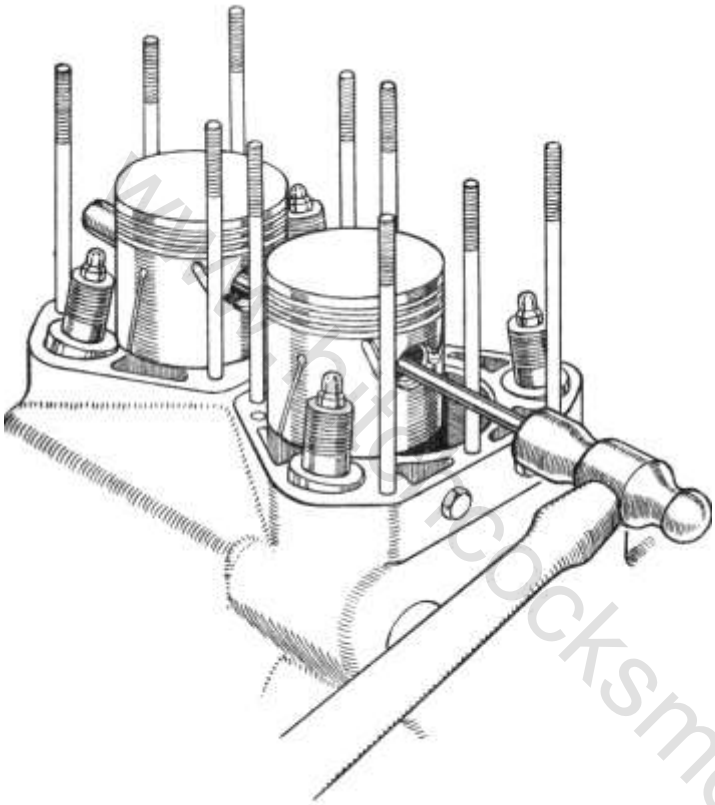
SPARKING PLUG INSERT
Fig. 6

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



REMOVAL OF PISTONS
Fig. 7

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

16. Removal of Pistons

Remove the cylinder heads and cylinders.

With a tang of a file remove 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. E.5477 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 mouths of the crankcase to prevent this.

17. Decarbonising

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

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

Scrape away all carbon from the valve heads and beneath the head, 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.

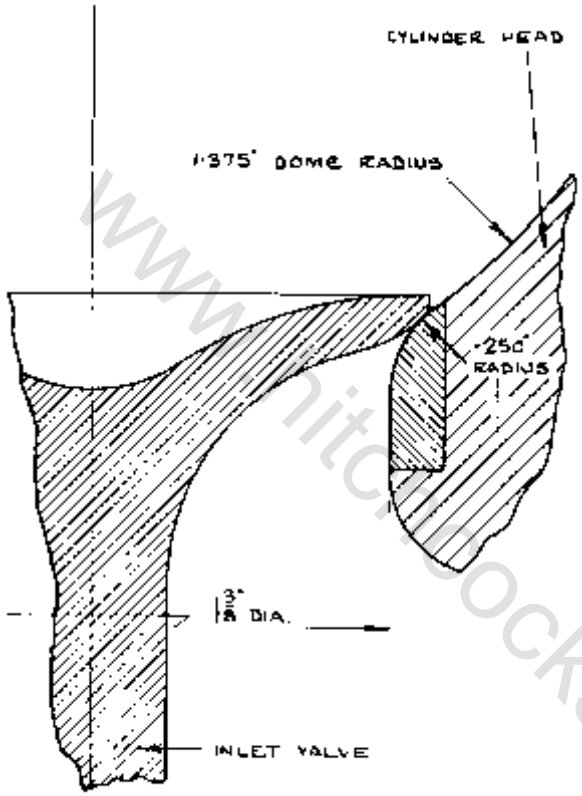
If the piston ring gaps exceed 1/16 in. when the rings are in position in the barrel, new rings should be fitted. The correct gap for new rings is .011-.015 in. The gap should be measured in the least worn part of the cylinder, which will be found to be the extreme top or bottom of the bore.

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

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

The faces and seats of the exhaust valves are cut at 45 degrees but the profiles of the inlet valves are of a special streamlined design which



INLET VALVE SEAT PROFILE
Fig. 8

eliminates pockets and sharp edges and allows a smooth flow of gas without eddies.

If the inlet valves or their seats are pitted and require recutting, care must be taken to reproduce the correct profile as shown in Fig. 8.

The cylinder heads should preferably be returned to the works for the inlet valve seats to be re-cut, but, if this is not possible, a special tool consisting of an arbor No. T 2053 and cutter No. T 2054 is available. Great care must be exercised in using this tool, as it is located off the valve guides and these may be damaged if suitable apparatus is not employed.

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

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.

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

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

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.

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

Replace the cylinder heads as described in Subsection 10.

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

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

20. Cleaning the Oil Filters

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

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

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

21. Overhaul of Oil Pumps

Remove the timing cover as described in Subsection 1.

Remove the end plates from both pumps.

Remove the pump discs and plungers.

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

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

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

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

The feed pump spring is stronger than that in the return pump and care must be taken to see that they are not interchanged. The feed pump is at the rear or on the right-hand side looking on the timing cover.

Check the pump disc springs for fatigue by assembling in the timing cover and placing the pump covers in position. If the springs are correct, the pump cover should held ¼ in. off the timing cover by the feed pump spring and 1/8 in. off by the return pump spring.

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 screw driver in a clockwise direction looking on the front and it can then be seen whether the pumps are operating correctly.

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

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

22. Removal of Timing Chains

Loosen the magneto fixing bolts.

Remove the magneto sprocket (Subsection 4).

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 sprockets.

23. Removal of Pump Worm and Timing Sprocket

Remove the timing chains (Subsection 22).

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

Withdraw the timing sprocket using Special Tool No. E.4869. Do not attempt to withdraw the sprocket by tapping the worm as this will dislodge the locking nut in the crankshaft. (See Section D, Subsection 6.)

24. Removal of Camshaft Sprockets

Remove the timing chains (Subsection 22).

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

Withdraw the sprocket by means of a suitable extractor.

25. Removal of Magneto Sprocket

Remove the timing cover and unscrew the nut securing the automatic advance mechanism. This will draw off the sprocket and auto-advance device from the magneto shaft.

26. Removal of Engine and Clutch Sprockets.

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

Remove the alternator stator by undoing three fixing screws.

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

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

To remove the clutch sprocket unscrew the three clutch spring pins then lift away the spring cap, springs and 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, having heated the case first.

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

The guide should have an interference of 0.015 to 0.025 in. in the crankcase and can be driven in with a bronze drift, care being taken when the guide is nearly home to avoid breaking the collar.

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 back-plate 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.

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

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

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

33. Rocker Oil Feed Relief Valves

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

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

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

34. Fitting the Alternator

The alternator consists of two parts, the stator and the rotor. The stator is mounted on the back half of the primary chaincase, being held in position by three studs and distance pieces. The rotor, which contains the permanent magnets is mounted by means of an adaptor on the end of the crankshaft and is secured by a stud and nut and located by a key.

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

Fit the rotor first, making sure that it is located concentrically on the end of the crankshaft. Attention must be given to the seating of the key because a badly-fitting key may cause the rotor to run unevenly. The nut holding the rotor in position is secured by a tab washer.

Having fitted the rotor, place the three distance collars over the three studs in the

primary chaincase and put the stator in position with the coil connections facing outwards.

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

Tighten the stator nuts and withdraw the strips.

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

An alternative, and more satisfactory, method of assembling the alternator requires the use of Special Tool No. T2055.

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

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

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

35. Removal of the Magneto

The magneto is bolted to the timing side crankcase by the hexagon-headed screws. Access to these is obtained by removing the timing cover (Subsection 1) and the magneto sprocket and automatic advance device (Subsection 25).

SECTION C11

Service Operations with Engine in Frame

Constellation

1. Removal of the Timing Cover

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

In refitting the cover, insert the two long screws through the cover to locate the gasket. See that the thrust washer is on the chain tensioner sprocket spindle and that the neoprene seal is in position on the oil feed plug. If the seal or plug is damaged a new one of either should be fitted. The seal is Part No. 42114 and the plug is Part No. 42113. (This seal can get damaged due to poor alignment of the crankshaft and oil feed plug. There is a modification available to alleviate this problem).

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

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

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

2. Valve Timing

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

The correct setting is obtained with the marks stamped on the camshaft sprockets facing each other inwards on the centre line and the mark on the crankshaft sprocket pointing vertically downwards. If it is necessary to remove the sprockets see 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. tappet clearance is as follows:-

Exhaust opens 83° before bottom dead centre.
Exhaust closes 35° after top dead centre.
Inlet opens 24° before top dead centre.
Inlet closes 73° after bottom dead centre.

3. Tappet Adjustment

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

The clearance between the end of the screw and the valve stem 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 of 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 cam.

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

3A. Removal of the Camshafts

Remove the timing cover (Subsection 1).
Remove the cam sprockets (Subsection 24).

Remove the three screws holding each of the camshaft bearing housings.

Compress the valve springs and withdraw the camshafts. It is necessary to rotate the camshafts slightly while withdrawing them in order that the cams will pass through the shaped hole in the crankcase.

When replacing the camshafts compress the valve springs and hold the tappets clear of the cams. If the rocker adjusting screws are screwed right back, it is not necessary to compress the valve springs.

4. Ignition Timing

To set the ignition timing, first remove the timing cover (subsection 1) and then remove

the magneto sprocket nut and withdraw the sprocket, using Special Tool No. 14835.

Set the contact points to .012 in., fully opened, but if they are worn or pitted refer to Section G.

Remove the sparking plugs and set the piston in the left-hand cylinder to 3/8 in. before top dead centre on the compression stroke (i.e., with both valves closed).

Set the contacts to be just breaking with the ignition control fully advanced.

Replace the driving sprocket and tighten the nut.

Replace the timing cover.

(To determine the point at which the contacts are just breaking, insert a piece of tissue paper between them and rotate the contact-breaker in an anti-clockwise direction until the paper can just be pulled out.)

5. Primary Chain Adjustment

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

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

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

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

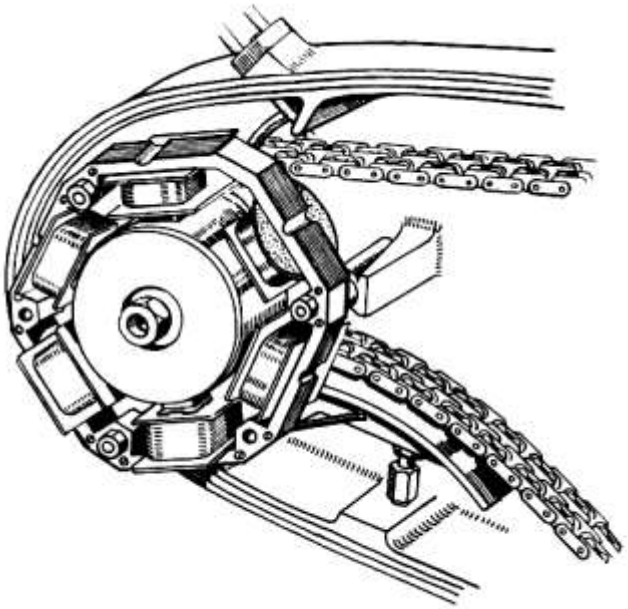
Re-tighten the locknut on the adjusting screw, replace the chain cover and replenish with oil.

6. Timing Chain Adjustment

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

Adjust the tension so that there is 1/4 in. movement of the chain.

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



PRIMARY CHAIN ADJUSTMENT

Fig. 1

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

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

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

7. Magneto Chain Adjustment

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

8. Removal of the Dual Seat and Rear Mudguard

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

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

9. Removal of the Petrol Tank

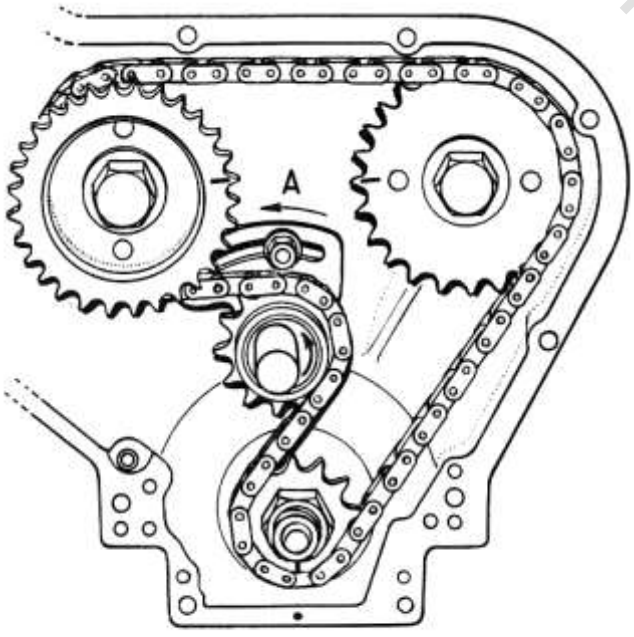
Remove the petrol tank by detaching the petrol pipe and removing the rubber mounted stud which secures the front of the tank to the frame. With early models release the bottom section of the rear clip by unscrewing the two 1/4 in. attachment nuts. Tap out the two studs and raise the rear of the tank to release the clip. The tank may then be removed.

With later models the rear tank attachment is in the form of a laterally situated bracket with a rubber block fixed to it, this bears against the underside of the frame top tube, drawing the tank down on to the rubber covering of the top tube.

To remove, unscrew the two bolts securing the bracket and lift the tank clear.

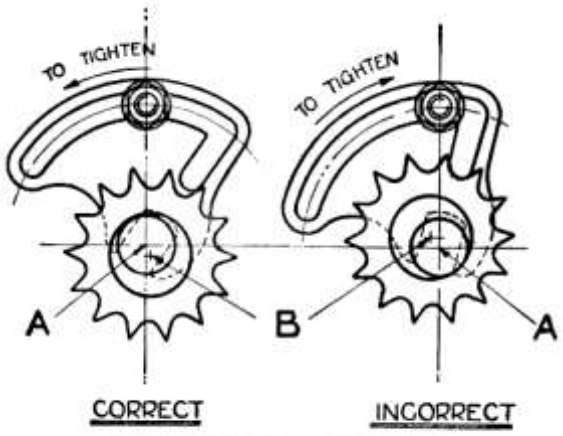
10. Removal of the Cylinder Head

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



TIMING CHAIN ADJUSTMENT SHOWING TIMING MARKS

Fig. 2



TIMING CHAIN ADJUSTMENT

Fig. 3

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

Disconnect the head steady link (early models).

Remove head steady brackets (later models).

Disconnect the oil pipes and plug leads.

Remove the exhaust pipes and carburettor(s) and induction manifold.

Remove the rocker box covers.

Turn the engine until both valves are closed.

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

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

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

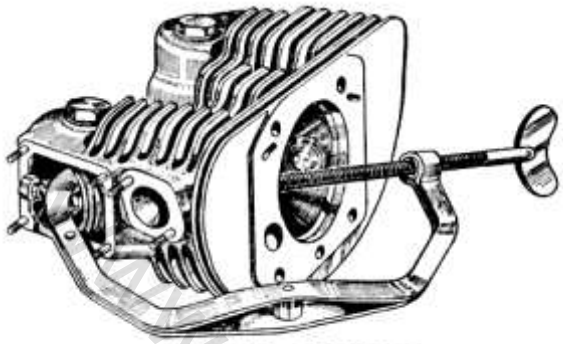
Lower the cylinder heads over the push rods, making sure that the rockers locate in the push rod cups.

Fit the head nuts and washers and partially tighten down.

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

11. Removal of the Valves

Having removed the cylinder head, remove the rockerbox covers, each held by four nuts, and swing the rocker clear of the valve. Using a suitable valve spring compressing tool, compress the valve springs and remove the split collets from the end of the valve stem. Slacken back the compressing tool and release the



REMOVAL OF VALVES
Fig. 4

springs. Withdraw the valve and place its springs, top spring collar (and bottom collar if it is loose) and split collets together in order that they may be re-assembled with the valve from which they were removed.

Deal similarly with the other valves in the heads.

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

12. Removal of the Rockers

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

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

13. Removal of the Valve Guides

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

The first is a piece of tube with an internal bore of not less than 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. 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. If a valve guide is removed for any reason, an oversize one should be fitted in order to maintain the interference. It is necessary to re-cut the valve seat and grind in the valve after a guide has been replaced. (See Subsection 18.)

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

14. Removal of the Sparking Plugs

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

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

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

The insert is placed over the tool with the tag engaging in the slot and it is screwed into the plug hole in the cylinder head from the outside until the last coil is 1 to 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 been removed, the fitting of the insert will be facilitated if the tool is put through the hole from the inside and the insert screwed back from the outside.

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

Note: Engines with a Number prior to SMSA 6800 have short reach plugs, in which case wire inserts are fitted as standard.

15. Removal of the Cylinders

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

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

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

16. Removal of Pistons

Remove the cylinder heads and cylinders.

With a tang of a file remove the two outer circlips retaining the gudgeon pins. Remove the

long central cylinder studs which come opposite the gudgeon pins.

Use Special Tool No. E.5477 to extract the gudgeon pin or using a rod about 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 mouths of the crankcase to prevent this.

17. Decarbonising

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

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

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

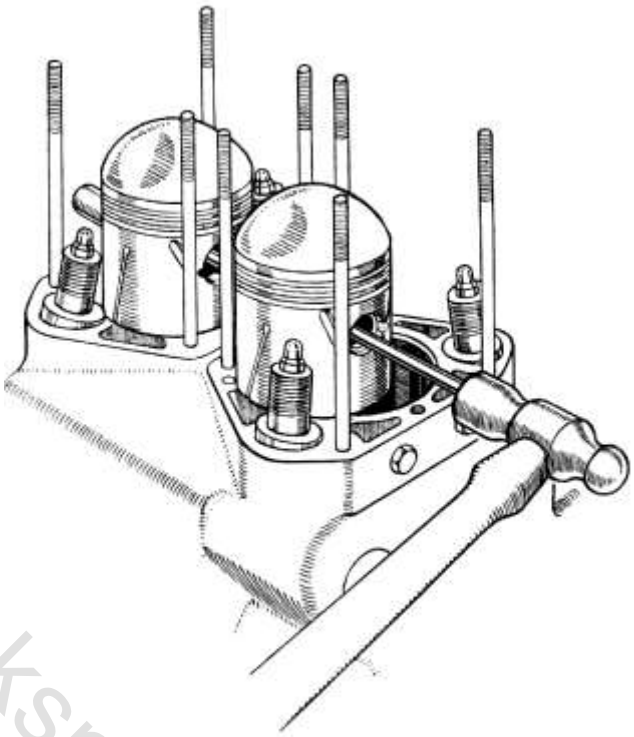
If the piston rings are removed the grooves should be cleaned out and new rings fitted. For cleaning the grooves, a piece of discarded ring thrust into a wooden handle and filed to a chisel point is a useful tool.

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

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



REMOVAL OF PISTONS
Fig. 5

cup and with a backwards and forwards rotary motion, grind it on to its seat. Alternatively, a tool which pulls on the valve stem can be used. Frequently lift the valve and move it round so that an even and true seating is obtained. If no light spring is available, the lifting will have to be done by hand. Continue grinding until a bright ring is visible on both valve and seating.

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

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

The cylinder heads should preferably be returned to the Works for the inlet valve seats to be re-cut, but, if this is not possible, a special tool consisting of an arbor No. T 2053 and cutter No. T2054 is available. Great care must be exercised in using this tool as it is located off the

valve guides and these may be damaged if suitable apparatus is not employed.

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

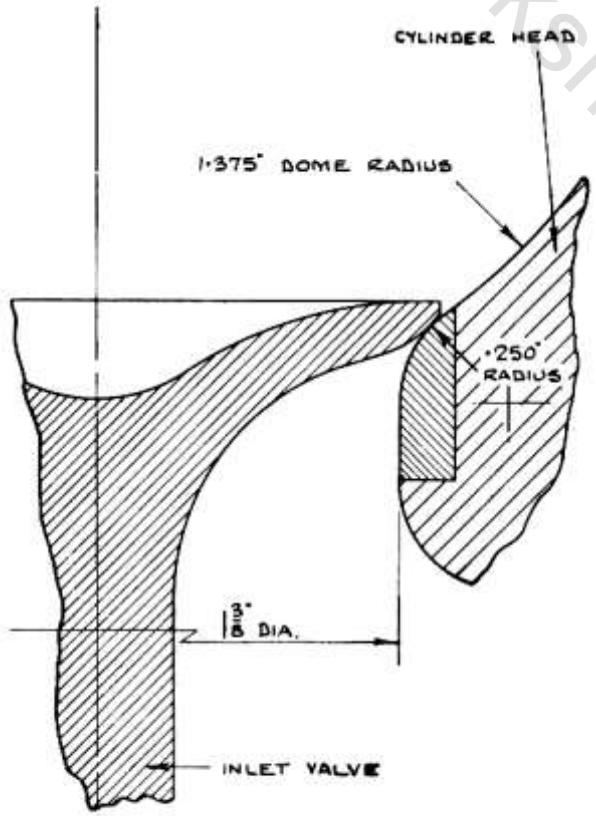
19. Re-Assembly after Decarbonising

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.

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

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

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



INLET VALVE SEAT PROFILE

Fig. 6

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.

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

Replace the cylinder heads as described in Subsection 10.

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

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

CORRECT RELATIVE POSITIONS OF DUAL SCRAPER RINGS (LATER MODELS)

Fig. 7

20. Cleaning the Oil Filters

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

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

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

21. Overhaul of Oil Pumps

Remove the timing cover as described in Subsection 1.

Remove the end plates from both pumps.

Remove the pump discs and plungers.

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

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

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

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

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

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 screw driver in a clockwise direction looking on the front and it can then be seen whether the pumps are operating correctly.

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

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

22. Removal of the Timing Chains

Remove the magneto and chain (Subsection 25).

Loosen the chain tensioner locknut and stud.

Lift the adjusting plate clear of the chain tensioner spindle.

Remove the chain tensioner spindle and sprocket.

Lift the chain off the sprockets.

23. Removal of Pump Worm and Timing Sprocket

Remove the timing chains (Subsection 22).

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

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

24. Removal of the Camshaft Sprockets

Remove the timing chains (Subsection 22).

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

Withdraw the sprocket by means of a suitable extractor.

25. Removal of the Magneto

Remove the timing cover (Subsection 1).

Remove three fixing nuts.

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

26. Removal of the Engine and Clutch Sprockets

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

On early models the alternator stator is removed by undoing the three fixing screws, but in the case of later types, the smaller diameter stator must be withdrawn from the adaptor ring after removing three nuts. The adaptor ring can then be removed from the primary chain case when the three screws have been taken out.

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

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

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

When replacing the engine sprocket, take care that the felt washer (neoprene on later models) 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. (See Subsection 31.)

27. Removal of the Tappets and Guides

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

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

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

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

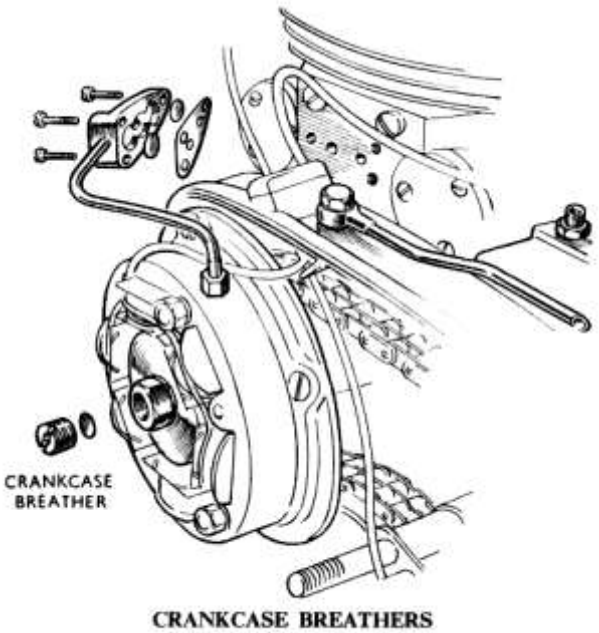
The guide should have an interference of .0015 to .0025 in. in the crankcase and can be driven in with a bronze drift, care being taken when the guide is nearly home to avoid breaking the collar.

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

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

28. Dismantling the Breathers

If the breathers are not operating efficiently, they may cause pressure in the crankcase,



CRANKCASE BREATHERS
Fig. 8

instead of a partial vacuum, giving rise to smoking or over-oiling.

See that the discs and backplate of the breather on the crankcase immediately below the left-hand cylinder are clean and undamaged, and that the discs are seating properly.

When reassembling the breather, apply jointing compound sparingly to the back of the steel plate, taking great care to keep the compound away from the discs and seatings.

Where fitted, the breather which operates through the end of the crankshaft, may be inspected by removing the slotted plug from the head of the rotor retaining bolt. (See Fig. 8.)

29. Removal of the Clutch

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

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

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

30. Removal of the Final Drive Sprocket

Remove the clutch as described in Subsection 29.

Remove the primary chain tensioner.

Remove the rear half of the primary 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 the Engine Bearing Housing Felt Washer (Engines prior to SMSA 6964)

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.

On Engine SMSA 6964 *et seq* a neoprene oil seal is fitted and the above does not apply.

32. Oil Pipe Unions

The oil feed to the rocker gear is through pipes from unions at the back of the crankcase below the cylinder base to unions on the cylinder heads.

The tapped holes into which the unions screw into the aluminium are fitted with steel wire inserts to prevent the threads in the

aluminium from stripping.

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

33. Rocker Oil Feed Relief Valve

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

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

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

34. Fitting the Alternator

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

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

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

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

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

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

Replace the nuts and shakeproof washers only fingertight, and insert six strips (preferably of nonmagnetic material) .015 in. thick and about 1/8 in. wide between the rotor and each pole piece.

Tighten the stator nuts and withdraw the strips.

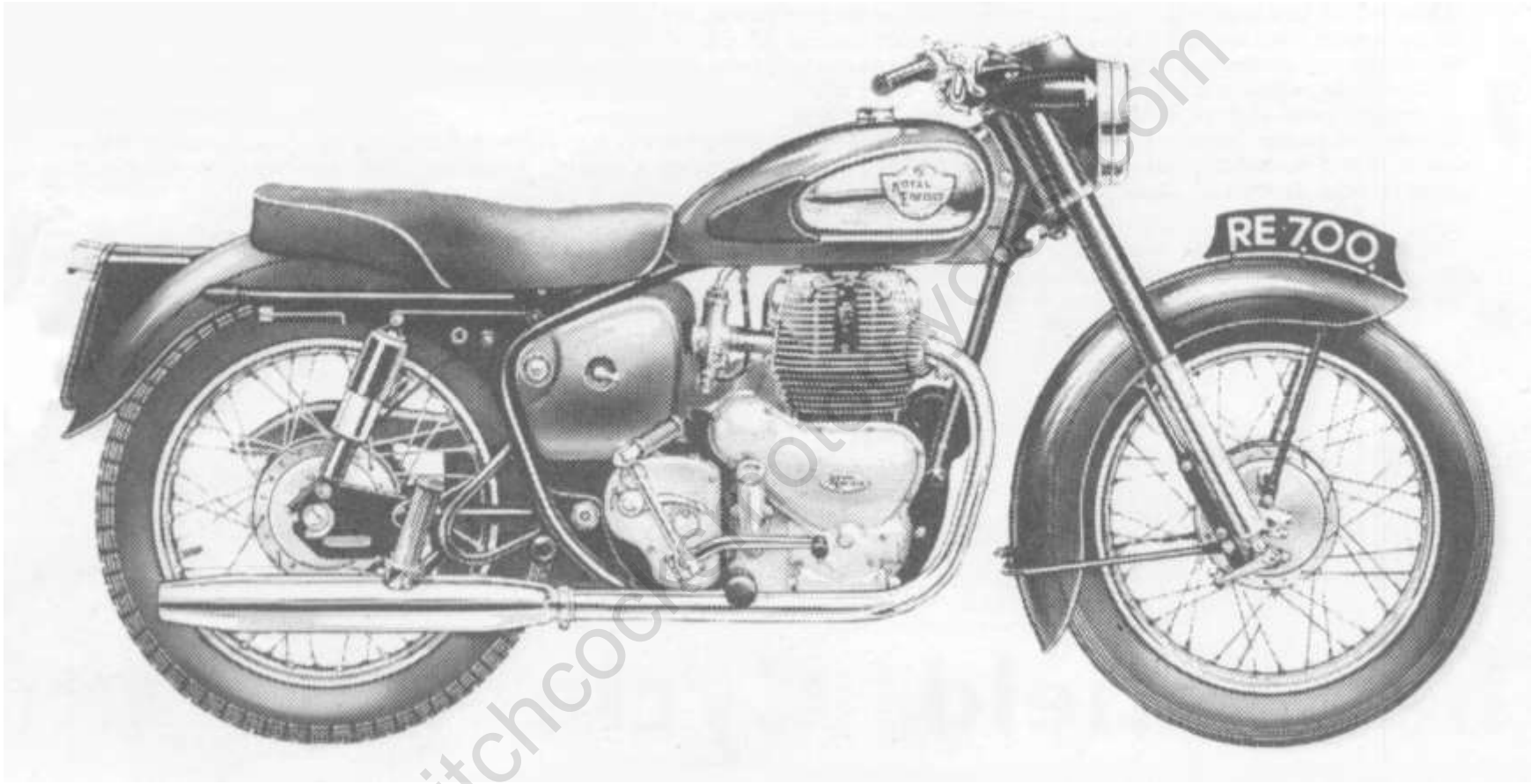
Check the air gap with narrow feelers and, if less than .010 in. at any point, remove the stator and file or grind the pole piece carefully until the correct gap is obtained.

An alternative, and more satisfactory, method of assembling the alternator requires the use of Special Tool No. T2055.

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

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

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



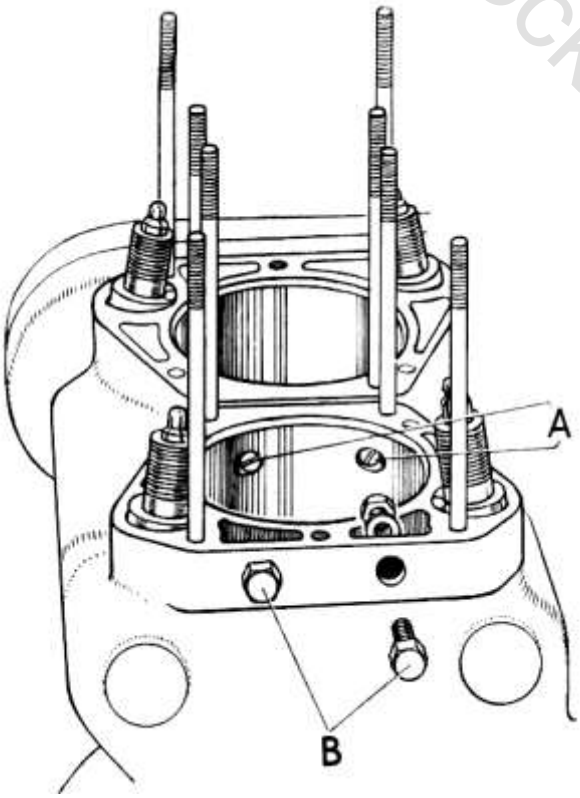
1959 SUPER METEOR

SECTION D10

Service Operations with Engine Removed
Super meteor and Constellation

1. Removal of the Engine Gearbox Unit from the Frame

Disconnect the battery leads.
Remove the dual seat and petrol tank.
Remove the engine steady.
Remove the tool box cover and slide the flexible connection to the air cleaner off the induction pipe (where fitted).
Remove the exhaust pipe.
Disconnect the electric horn leads.
Loosen the rectifier bracket and swing the rectifier clear.
Remove contact breaker cover.
Remove carburettor fixing pins.
Remove the rear chain.



REMOVAL OF SCREWS IN CRANKCASE (EARLY MODELS)
Fig. 1

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

2. Removal of the Gear Box

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

3. Dismantling the Crankcase

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

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

The inner race of the roller bearings on the timing side will remain on the crankshaft bringing with it the cage and rollers and leaving the outer face 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 degrees C. by immersion in hot water or in an oven after which the bearing can be driven out using a drift **which applies pressure to the outside race only.**

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

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

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

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

5. Fitting the Connecting Rods

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

If the big end 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 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 approximately 1/8 of a turn.

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

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

6. 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 the crankshaft as described in Subsection 4.

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

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

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

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

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

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

Apply jointing compound to the timing side crankcase.

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

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

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

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

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

Apply jointing compound to the driving-side crankcase.

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

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

Bolt the two halves of the crankcase together.

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

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

7. Crankshaft Plugs

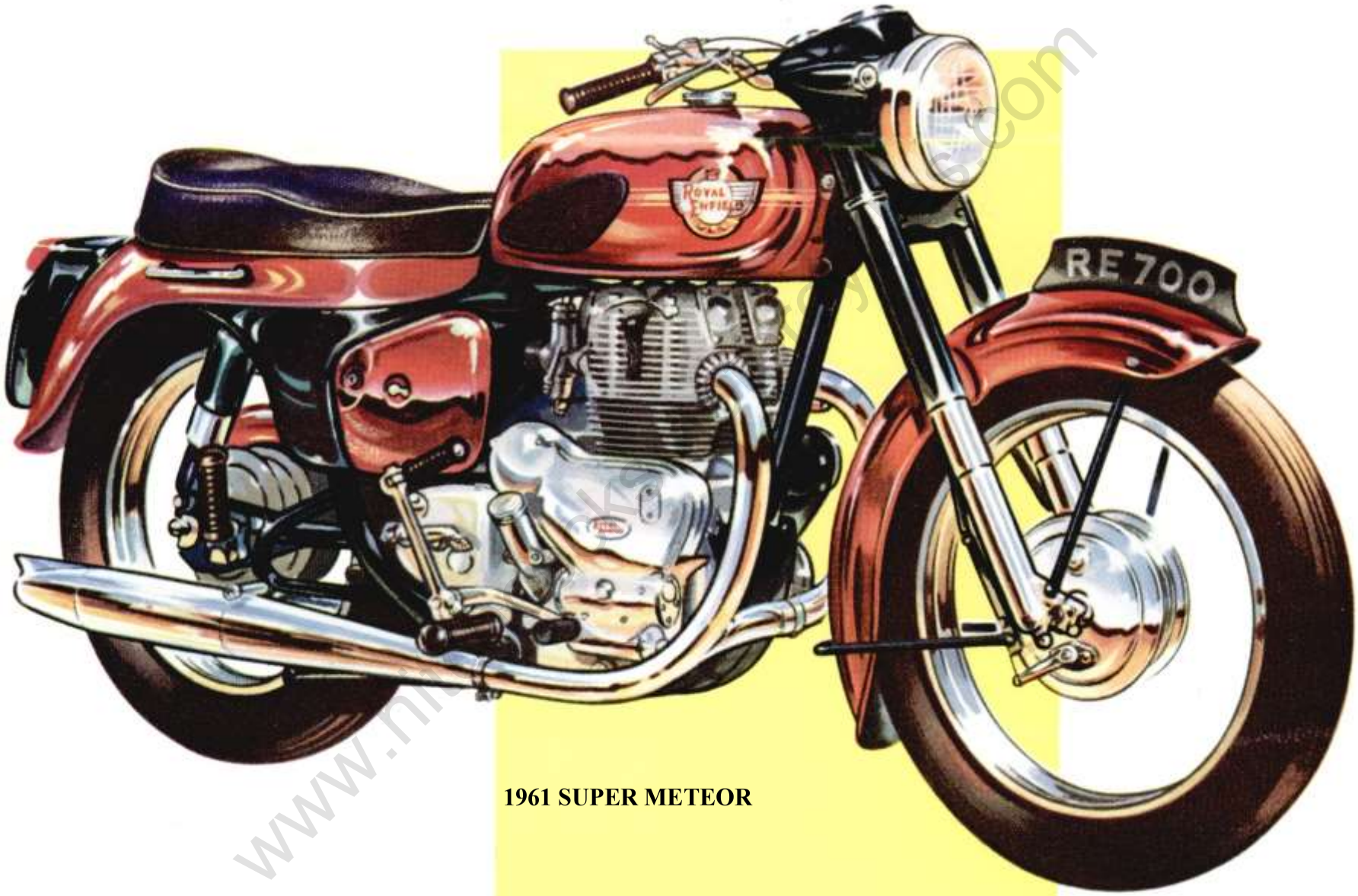
The oil passage through the big ends is sealed by two screwed aluminium plugs locked by centre punching.

If the crankshaft is taken out of the engine for any reason, the plugs should be removed and the oil passage cleared of sludge.

8. Pump Worm Threads

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

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

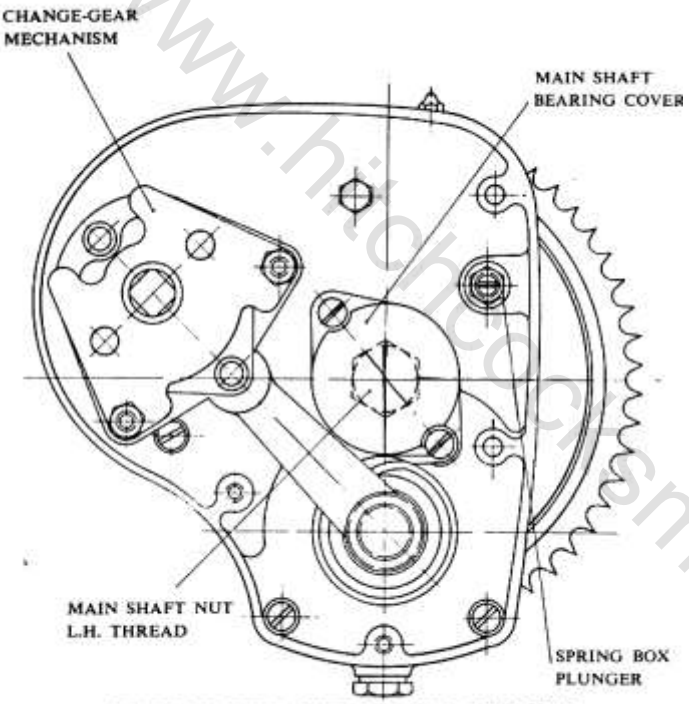


1961 SUPER METEOR

SECTION E4

Gearbox and Clutch

Super Meteor + 1961 Constellation



GEARBOX WITH OUTER COVER REMOVED
Fig. 1

1. Removal of Gearbox

This is described in section D, subsection 2. 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 detached.

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.

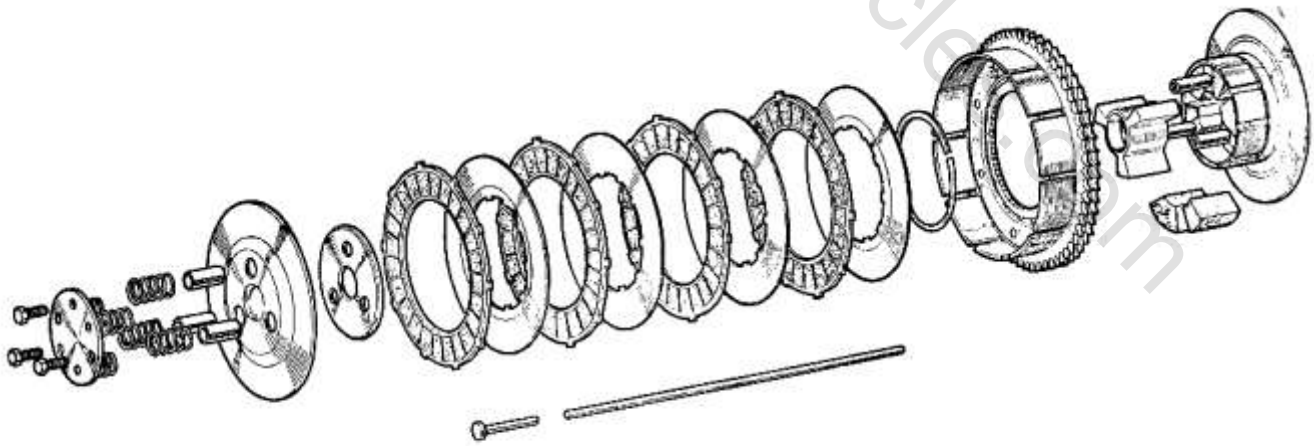
Remove four cheese-headed screws and hexagon bolt.

Remove the spring box locating plunger nut and washer.

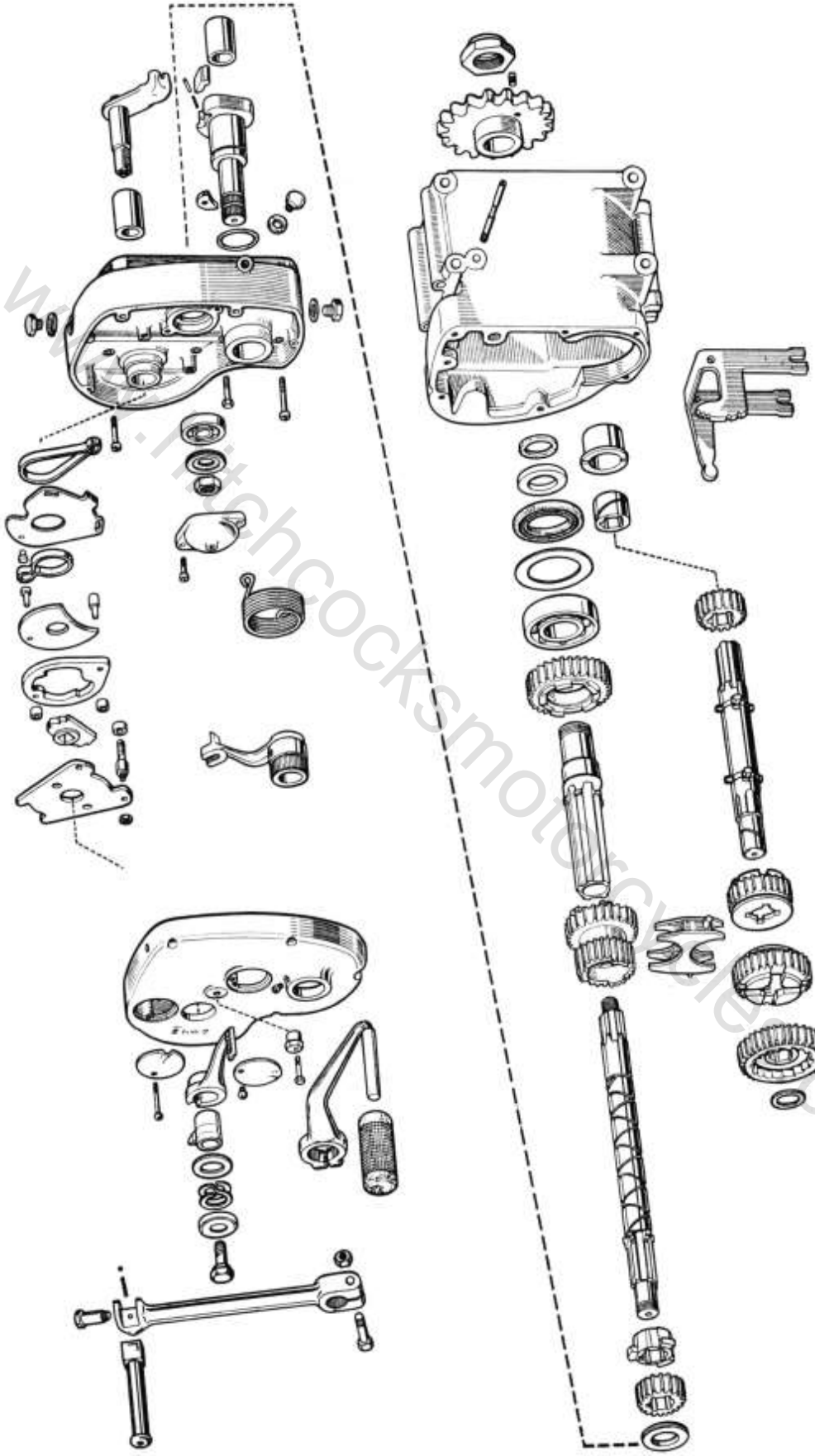
Remove the main shaft nut **(Left Hand Thread).**

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.



EXPLODED VIEW OF CLUTCH
Fig. 2



EXPLODED VIEW OF GEARBOX
Fig. 5

(See Section C1 or C2.) 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 C2.)

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 C2.

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

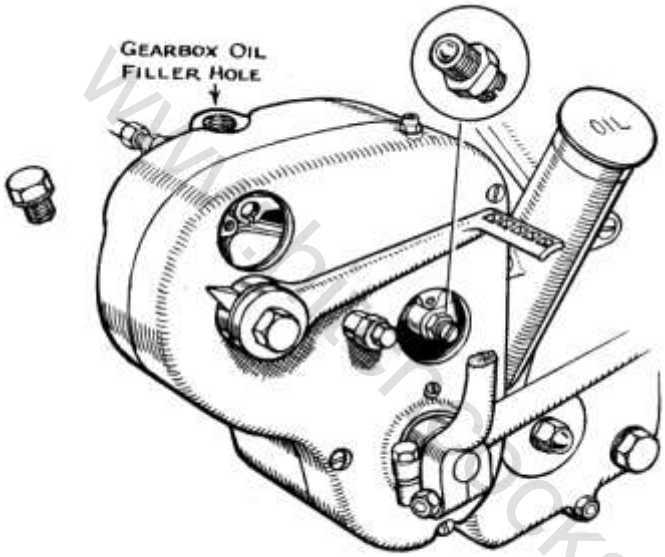
It is essential that there should be about 1/16 in. free movement in the clutch cable, to ensure that all the spring pressure is exerted on the plate.

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.

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 and fork behind the cover to be kept in their proper positions 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.



CLUTCH ADJUSTMENT
Fig. 4

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 until the correct movement of the pedal is obtained.

9. Gearbox Oil Level

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

SECTION E7
Gearbox and Clutch
1958 – 1960 Constellation

1. Description of the Clutch

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

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

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

The driving plates comprise the clutch sprocket itself, which has a ring of friction material riveted to each side, and three plates which rotate with it. Early models have all three plates pierced and fitted with Klingerite inserts, but later models use a pierced plate with friction material inserts only on the plate nearest the clutch sprocket. The other two plates employ a material particularly resistant to slip, which is bonded on to both sides of each plate.

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

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

2. Description of the Gearbox

The operation of the gearbox is shown diagrammatically in Fig. 3.

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

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

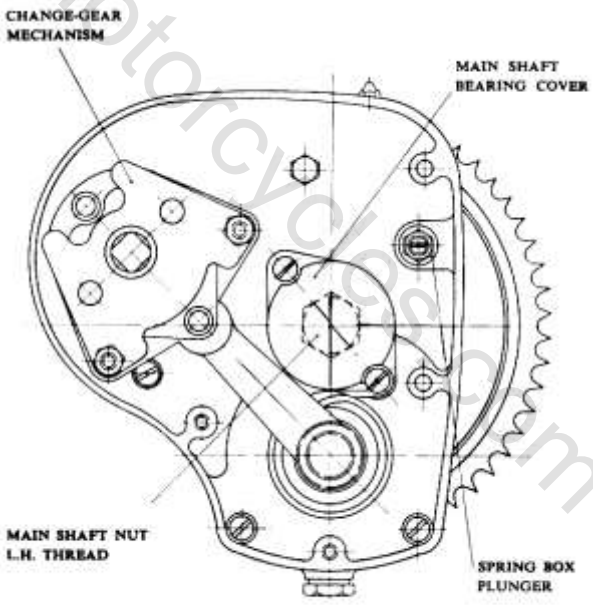
The mainshaft sleeve C has splines on which slides a double pinion KL. This double pinion KL engages with two pinions M and N which are free to rotate or slide on the layshaft G.

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

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

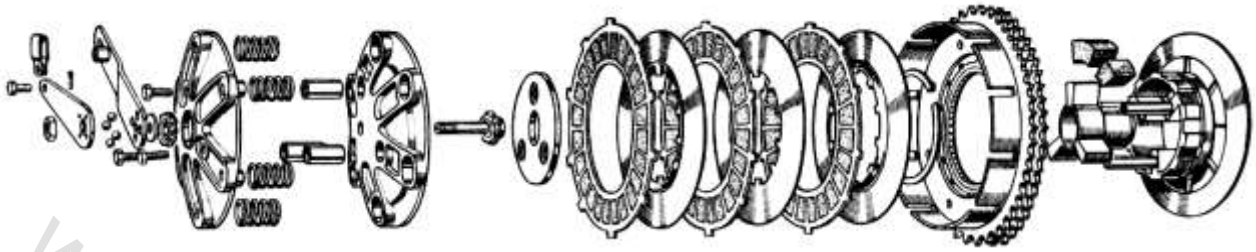
The double pinion KL and the pinions M and N all slide together and are moved by the operator fork R and are located by a spring plunger S which engages with a notched plate which is part of the operator arm R.

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



GEARBOX WITH OUTER COVER REMOVED

Fig. 1



EXPLODED VIEW OF CLUTCH
Fig. 2

3. Removal of the Gearbox

This is described in Section D, Subsection 2.

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

4. To Dismantle the Gearbox

First remove the kickstart crank, the changegear lever and the neutral finder and pointer.

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

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

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

Remove four cheese-headed screws and one hexagon bolt.

Remove the spring box locating plunger nut and washer.

Remove the mainshaft nut **(left-hand thread).**

The gearbox inner cover can then be removed.

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

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

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

5. Removal of the Ball Races

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

When refitting the bearings stepped drifts of 2.5/16 – 1.11/64 in. diameter and 1.11/16 – 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 mainshaft bearing and the dished pen-steel washer between the bearing and the felt washer. (Later gearboxes use a neoprene seal with a flat washer). The second dished pen-steel washer, if fitted, has a smaller central hole and is on the other side of the mainshaft bearing and is nipped between the inner face of the bearing and the shoulder on the final drive sleeve. However this is ommited from later gearboxes. See that both of the dished pen-steel washers have their raised portions facing towards the clutch and final drive sprockets.

6. Change-Gear Mechanism

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

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

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

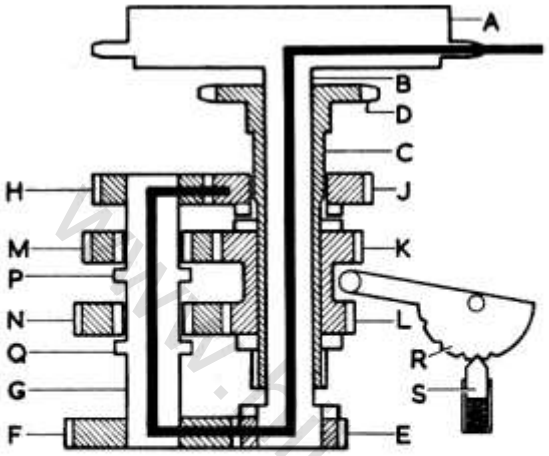
If too much movement is already present, a new adjuster plate giving less movement must be fitted.

7. Reassembling the Gearbox

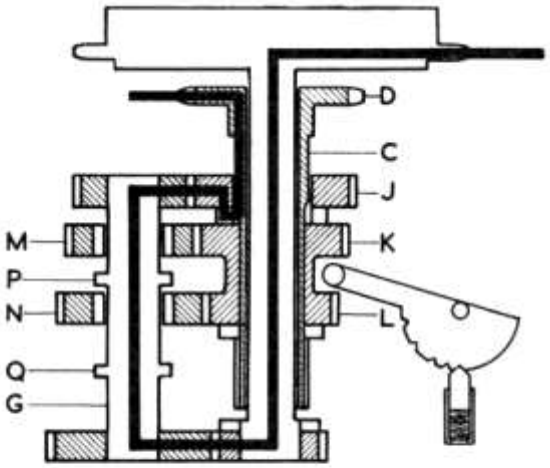
The procedure is the reverse of that given in Subsection 4, but the following points should be noted :

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

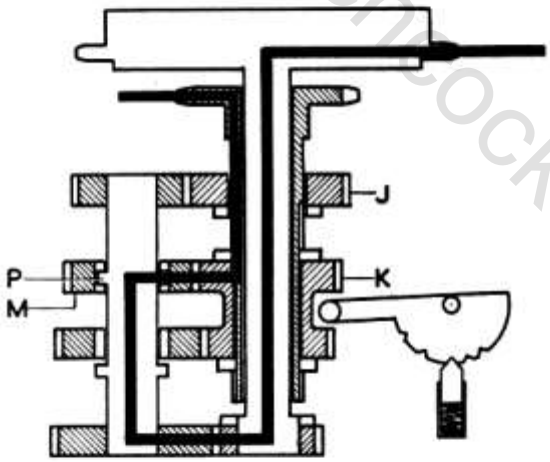
Make sure that the trunnions on the operator fork engage with the slots in the inside operator.



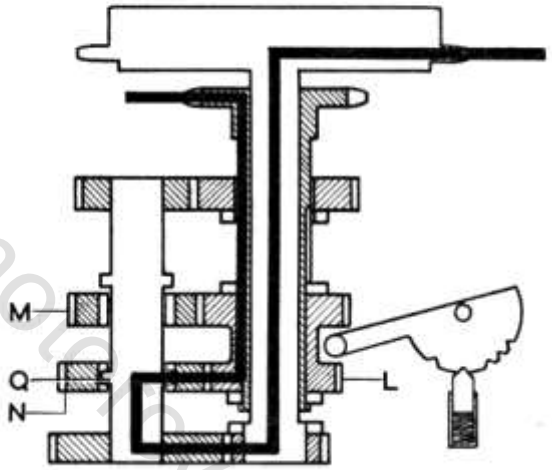
(A) NEUTRAL



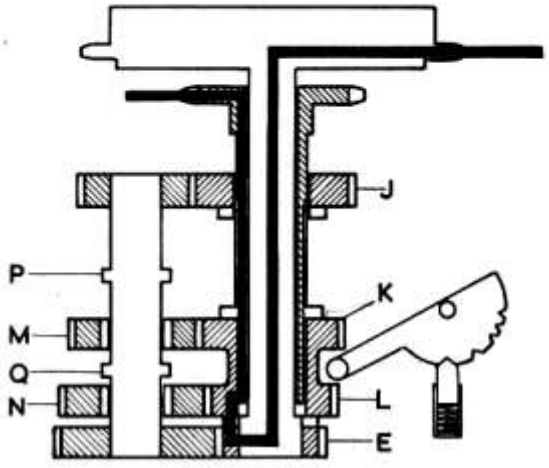
(B) FIRST GEAR



(C) SECOND GEAR



(D) THIRD GEAR



(E) TOP GEAR

Fig. 3A -Neutral. None of the dogs is engaged so that the mainshaft B and pinions E, F, H, J are rotating but the mainshaft sleeve C and the final drive sprocket are stationary.

Fig. 3B-Bottom Gear. The sliding pinions K, L, M, N have moved over so that the dogs on K engage with the dogs on the pinion J. This causes the double pinion KL, the mainshaft sleeve C and the sprocket D to rotate with the pinion J which is being driven from the mainshaft through the layshaft G. The dogs P and Q are not engaged.

Fig. 3C-Second Gear. The sliding pinions have moved so that the dogs on J are disengaged but the dogs P on the layshaft engage with the pinion M. The drive from the mainshaft and layshaft then passes through pinions M and K to the splines on the mainshaft sleeve and the pinion J is free on the sleeve.

Fig. 3D-Third Gear. The sliding pinions have moved further over so that the dogs Q on the layshaft engage with the pinion N which drives the pinion L and thus the mainshaft sleeve, the pinion M being free on the layshaft.

Fig. 3E-Top Gear. The sliding pinions have now moved right over so that both sets of dogs P and Q on the layshaft have disengaged but the dogs on the double pinion KL have engaged with those on the pinion E and the mainshaft and sleeve rotate together giving a one to one drive through the gearbox from the clutch sprocket to the output sprocket, the pinions M, N, J being free to rotate.

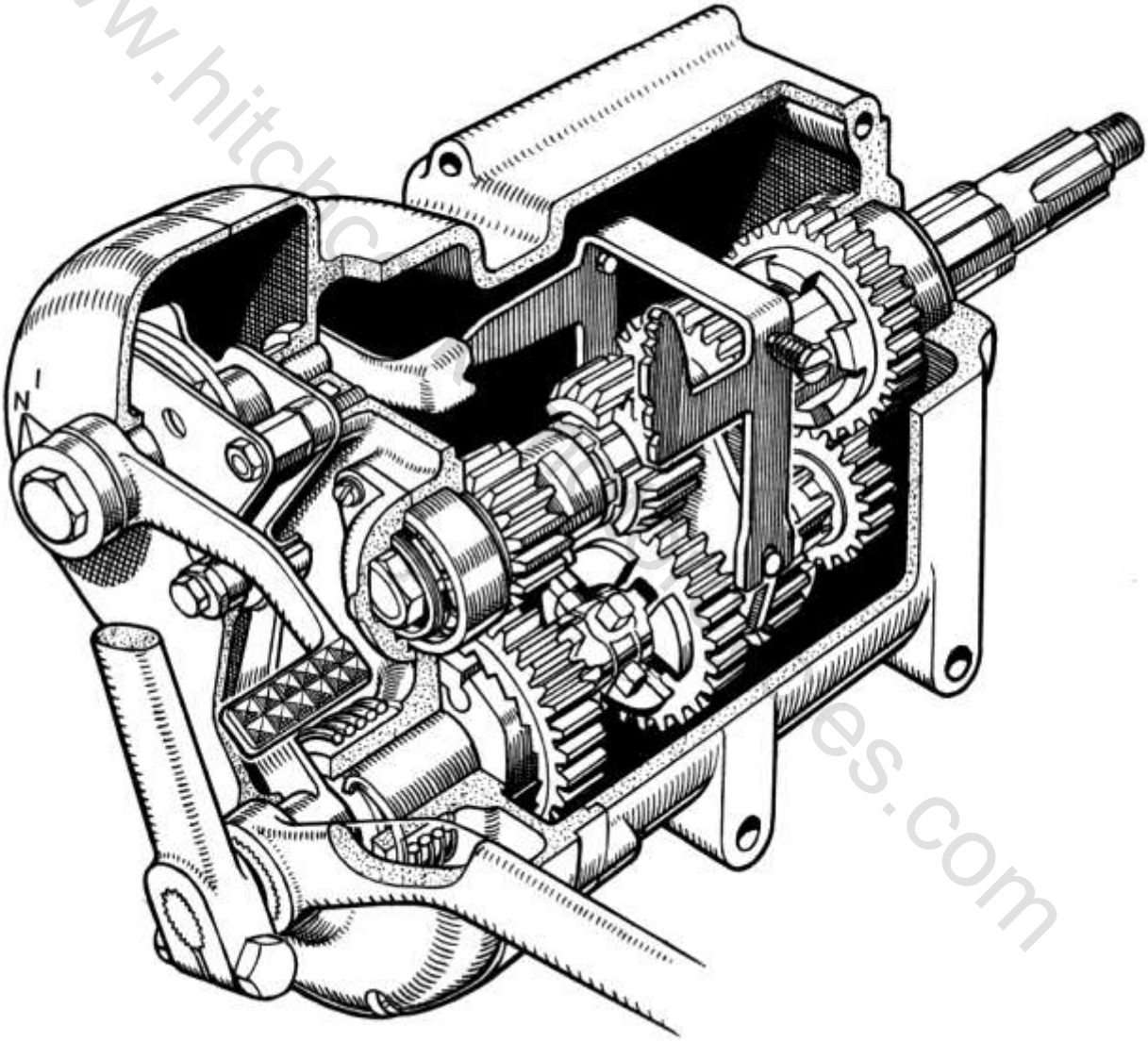
OPERATION OF GEARS
Fig. 3

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

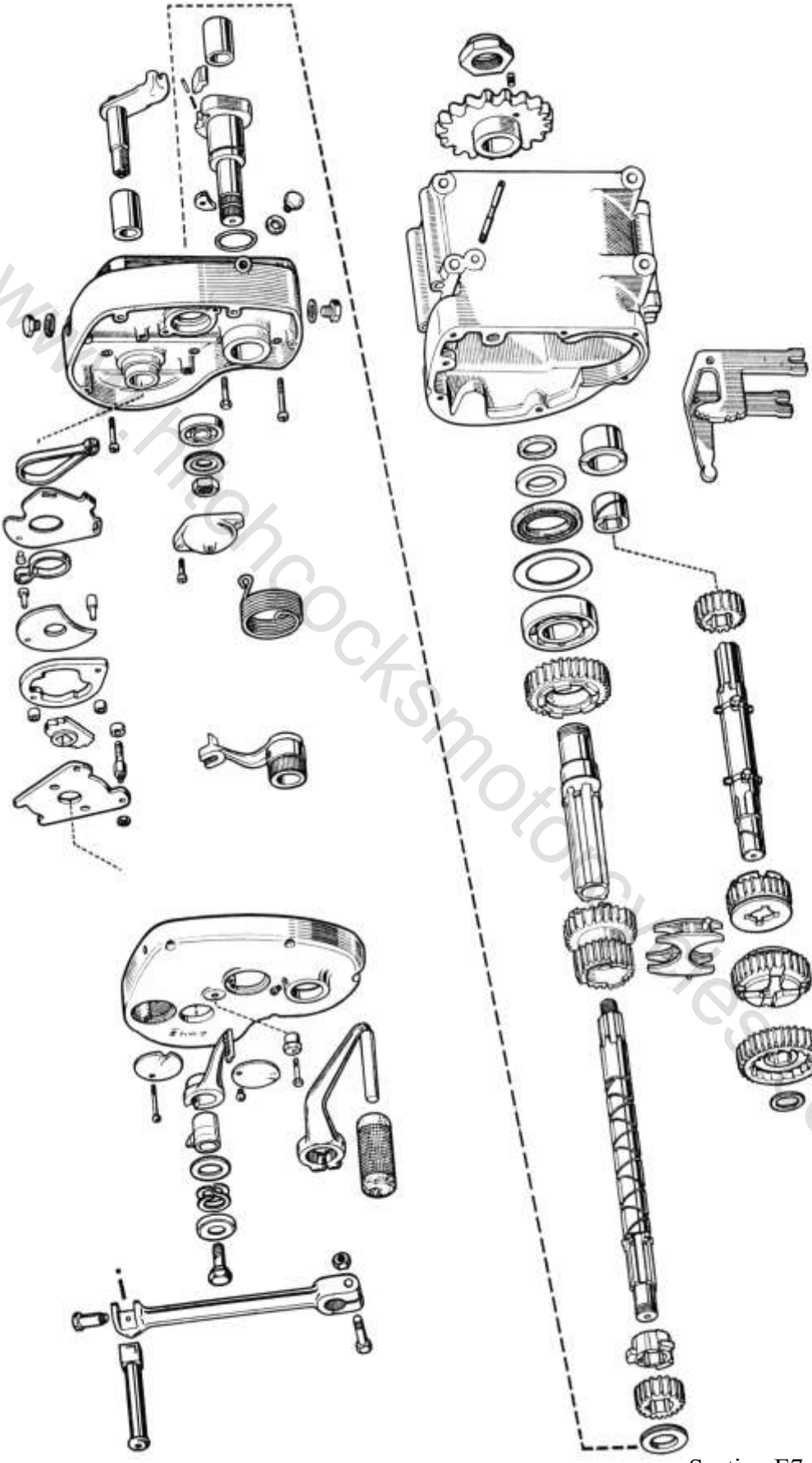
The layshaft top gear and kickstarter pinion should be assembled on the layshaft and the kickstarter shaft and ratchet assembled on to it before fitting the end cover. Do not forget the washer on the layshaft between the kickstarter pinion and the kickstarter shaft.

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

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



CUTAWAY SECTION OF GEARBOX
Fig. 4



EXPLODED VIEW OF GEARBOX
Fig. 5

8. Dismantling and Reassembling the Clutch

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

When reassembling the clutch, the following sequence must be adhered to, after first securing the clutch sprocket with the large circlip.

Fit the cush rubbers, retaining plates and three distance tubes, and follow with the pressure plate assembly as follows:

Plain dished plate (dish projecting outwards).
Friction plate.
Plain flat plate.
Friction plate.
Plain dished plate (dish projecting inwards).
Friction plate.

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

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

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

9. Adjustment of Clutch

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

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

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

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

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

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

10. Adjustment of the Neutral Finder

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

11. Gearbox Oil Level

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

SECTION F3

Amal 10TT9 Carburetter

1. General Description

This carburetter comprises two main parts, the mixing chamber and the float chamber. They are held together by the jet holder, which houses the main jet and the needle jet. Above these, and inside the mixing chamber, is the choke adaptor into which, from below, is screwed the jet choke tube. Sliding in the mixing chamber and surrounding the choke adaptor is the throttle valve (No. 5) and into this is clipped the jet needle by means of a sliding clip which will fit into any one of seven grooves. A tapered spring fits between the throttle valve and the mixing chamber top, which is secured by a screwed ring or cap.

At the side of the mixing chamber is a projecting boss having a narrow slot towards its lower end. Into the top of this boss a narrow slide is fitted, spring controlled and connected, through a cable, to the air lever on the handlebar.

Screwed into the mixing chamber body just below the inlet to the engine is the pilot jet which is spring loaded and controls the slow running idling speed.

The mixing chamber is mounted on the cylinder head by a two-bolt flange and the air intake tube is screwed to the outer face of the mixing chamber. A spring clip embracing this tube is used to lock the top cap in position.

Screwed into the base of the float chamber is a base plug embodying a guide for the float. The float operates a needle valve seating in the float chamber top, which is secured to the float chamber by two screws. A float tickler is provided and a single banjo, connecting to the petrol feed, is secured by a large banjo nut.

2. Dismantling the Carburetter

By unscrewing the top cap from the mixing chamber, the top, spring, throttle slide and needle may be withdrawn. To remove the needle from the slide, pull the copper clip sideways from the needle groove.

To gain access to the main jet, remove the hexagon plug from beneath the float chamber connection; the hexagon bodied main jet may then be unscrewed. It fits into the jet holder, which is screwed into the mixing chamber. Unscrewing the jet holder releases the float chamber and also gives access to the needle jet, which is screwed into the top of the jet holder.

If you look up into the bottom of the mixing chamber when the jet holder has been removed, the jet choke tube will be seen. This is slotted to facilitate its removal, which should not be necessary, however, neither should it be necessary to remove the choke adaptor, but if it is removed, take note of the washer beneath it. Take note, also, of the two washers, one above and the other below the float chamber connection to the mixing chamber.

To dismantle the float chamber (it is assumed that the petrol feed connection has been broken), remove the float chamber banjo nut and the banjo, taking care of the washers on either side of the banjo. Unscrew the two hexagon headed screws which secure the float chamber top and remove the latter. This will release the float needle and give access to the float in the float chamber. The float guide may be removed by unscrewing it from below

3. Carburation

The “choke” or effective bore of the carburetter is of great importance for maximum speed. The design in this carburetter is such that the maximum volume of air may flow through to charge the cylinder, also causing the maximum depression or suction on the jet to supply the fuel and atomise it.

Needle Control to the Jet. Perfect carburation throughout the range of the opening of the throttle means acceleration clean and snappy. This is where the needle control plays its part; you have a large main jet for power and for cooling the engine, and unless it is controlled it may give you a woolly rich mixture at small throttle openings -bad for acceleration and plugs. The needle reduces the flow of petrol above the main jet, and being taper, it reduces it most at small throttle openings, and as the throttle is opened, so the taper allows a bigger flow until the throttle is about three-quarters open, when the needle ceases to have any effect, and the main jet is fully in play.

The needle is attached to the throttle by a clip, the clip embracing one of seven grooves. This enables you to tune on the needle once you have set the main jet for power, by lowering the needle to get less petrol and vice versa, in its relation to the throttle opening. The needle is controlling the fuel flow in a needle jet, which has an accurately made bore, and this screws into the bolt that holds the float chamber to the

Fig. 1 AMAL 10TT9 CARBURETTER

mixing chamber. The standard needle jet bore is numbered.

The Throttle Valve surrounds the choke block in the carburetter, and when it is open leaves a perfectly shaped passage. Apart from controlling the main jet outlet, it is also used to control the supply of air to the main jet supply at low throttle openings-this actual control is by means of the cut-away on the lower edge of the intake side of the throttle valve - a smaller cut-away increasing the mixture strength at smaller throttle openings and a larger cut-away a weakening effect.

Throttles with different cut-aways can be supplied, the number of the cut-away being the height of the cutaway from the bottom edge measured in sixteenths of an inch.

Jets. The pilot jet, for starting off with, is unlike the standard Amal touring pilot jet because the adjustment regulates the fuel flow and not the air. This adjustment gives a wider range for any fuel which is mixed with air coming through a small hole under the Carburetter-this mixture for idling and "starting off" passes through into the carburetter outlet just behind the throttle, and is again mixed with air coming under the throttle through the main bore.

The main jet can be got at easily without disturbing the float chamber by removing the hexagon cap under the bolt that holds the float chamber to the mixing chamber. Main jets are numbered, the higher the number the larger the flow; various numbered main jets are available to suit requirements.

Float Chamber. The float chamber fitted to the current Model T.T. Carburetter is of a modified top-feed design incorporating a large-headed needle and seating, which ensures that the float chamber is capable of passing 10 gallons an hour, which is more than enough even when pure alcohol fuel is used. Consequently, the introduction of this float chamber has removed the necessity for a double float chamber as fitted previously.

Locking Devices. Vibration causes parts to come undone, so we have devised simple and quick locking devices that are sure, viz. a leaf spring which is anchored on to the air funnel and engages the knurled mixing chamber cap, and a drilled boss for wiring up to hold the float chamber holding screw to prevent it from vibrating loose. For the petrol pipe union we leave you to make your own device.

Compensation and Air Control. The main jet does not spray directly into the choke bore of the mixing chamber. It first passes through the needle jet and is there partially atomised by a blast of primary air, which can be seen at the base of the main choke. The richness of the mixture as it passes through the primary choke can be handlebar regulated by the air control at the side of the carburetter, less air being admitted to enrich the mixture for starting or atmosphere conditions demanding more liquid fuel to give the correct mixture strength. As the engine speed increases at a given throttle opening so the mixture would tend to get rich, but as the air flow through the primary choke above the main jet also increases, there is a damping effect on the flow of liquid and a compensated mixture is obtained.

Needle-Jet. Before tuning the carburetter, confirm that the correct size needle jet is fitted.

Standard Carburetter Settings
Carburetter Type : Amal 10TT9.
Main Jet : 480.
Needle Jet : - 109.
Choke Bore : $1^{3}/_{16}$ in.
Throttle Valve : 5.
Needle Position : No. 3 Groove.
Float Chamber : 302/10 Single Banjo.

4. Tuning Instructions

To get carburation for any stated fuel when the choke bore is correct for the peak revs. of the engine and the correct needle jet for the fuel to be used, the procedure is simple. Start off with an assumed setting, and then tune as follows. There are four phases

(i) Main jet for power at full throttle.
(ii) Pilot jet for idling.
(iii) Throttle cut-away for "take-off" from the pilot jet.
(iv) Needle position for "snappy" mixture at quarter to three-quarter throttle; then final idling adjustment of the pilot jet.

Always tune in this order, then any alteration will not upset a correct phase.

Sequence of tuning. (i) Main jet size. (ii) Pilot jet adjustment. (iii) Throttle valve cut-away. (iv) Needle attachment.

(i) Main Jet Size. This should be determined first: the smallest numbered jet which gives the greatest maximum speed should be selected, keeping in mind the safety factor for cooling. (The air lever should be fully open during these tests.)

(ii) Pilot Jet Adjustment. Before attempting to set the pilot adjuster the engine should be at its normal running temperature, otherwise a faulty adjustment is possible, which will upset the correct selection of the throttle valve. The pilot adjuster, which controls the amount of fuel passed, is rotated clockwise, to weaken the

mixture, and anti-clockwise to enrich it. Adjust this very gradually until a satisfactory tick-over is obtained, but take care that the achievement of too slow a tick-over - that is, slower than is actually necessary-does not lead to a "spot" which may cause stalling when the throttle is very slightly open.

(iii) Throttle Cut-away. Having set the pilot adjuster, open up the throttle progressively and note positions where, if at all, the exhaust note becomes irregular. If this is noticed, leave the throttle open at this position and close the air lever slightly; this will indicate whether the spot is rich or weak. If it is a rich spot, fit a throttle valve

With more cut-away on the air intake side (or vice versa if weak).

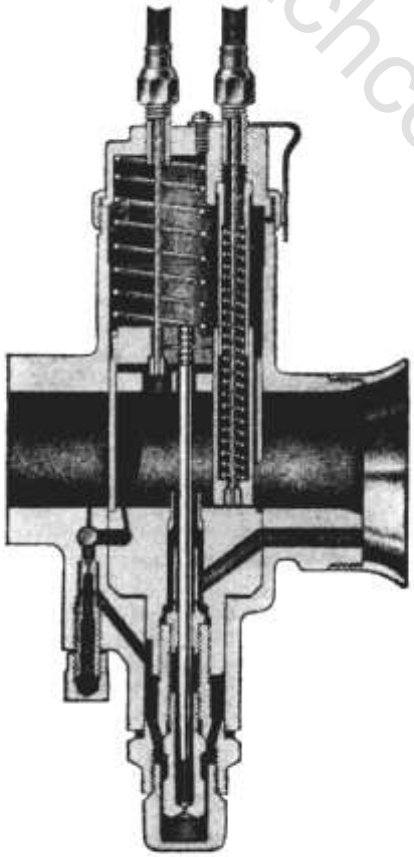
*(iv) Jet Needle Position.*Tuning sequence (ii) and (iii) will affect carburation up to somewhere over one-quarter throttle, after which the needle (which is suspended from the throttle valve comes into action and when the throttle is opened, further and tests are again made for rich or weak spots (as previously outlined) the needle can be raised to enrich or lowered to weaken the mixture whichever may be found necessary. With these adjustments correctly made, and the main jet size settled, a perfectly progressive mixture will be obtainable from tick-over to full throttle.

Amal Monobloc Carburetter

1. General Description

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

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



SECTION THROUGH MIXING CHAMBER, SHOWING AIR VALVE AND THROTTLE CLOSED

Fig. 1

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

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

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

2. Tuning the Carburetter(s)

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

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

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

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

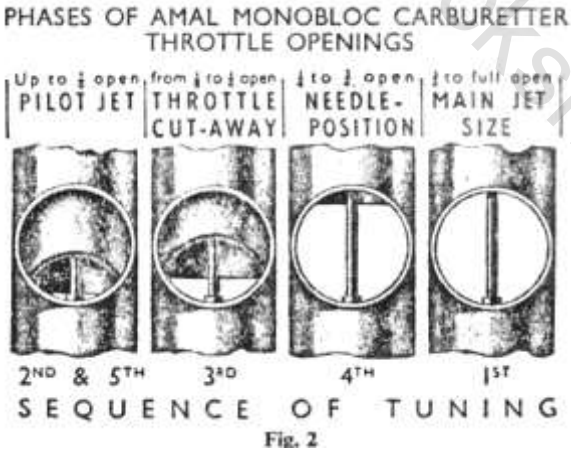


Fig. 2

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

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

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

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

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

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

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

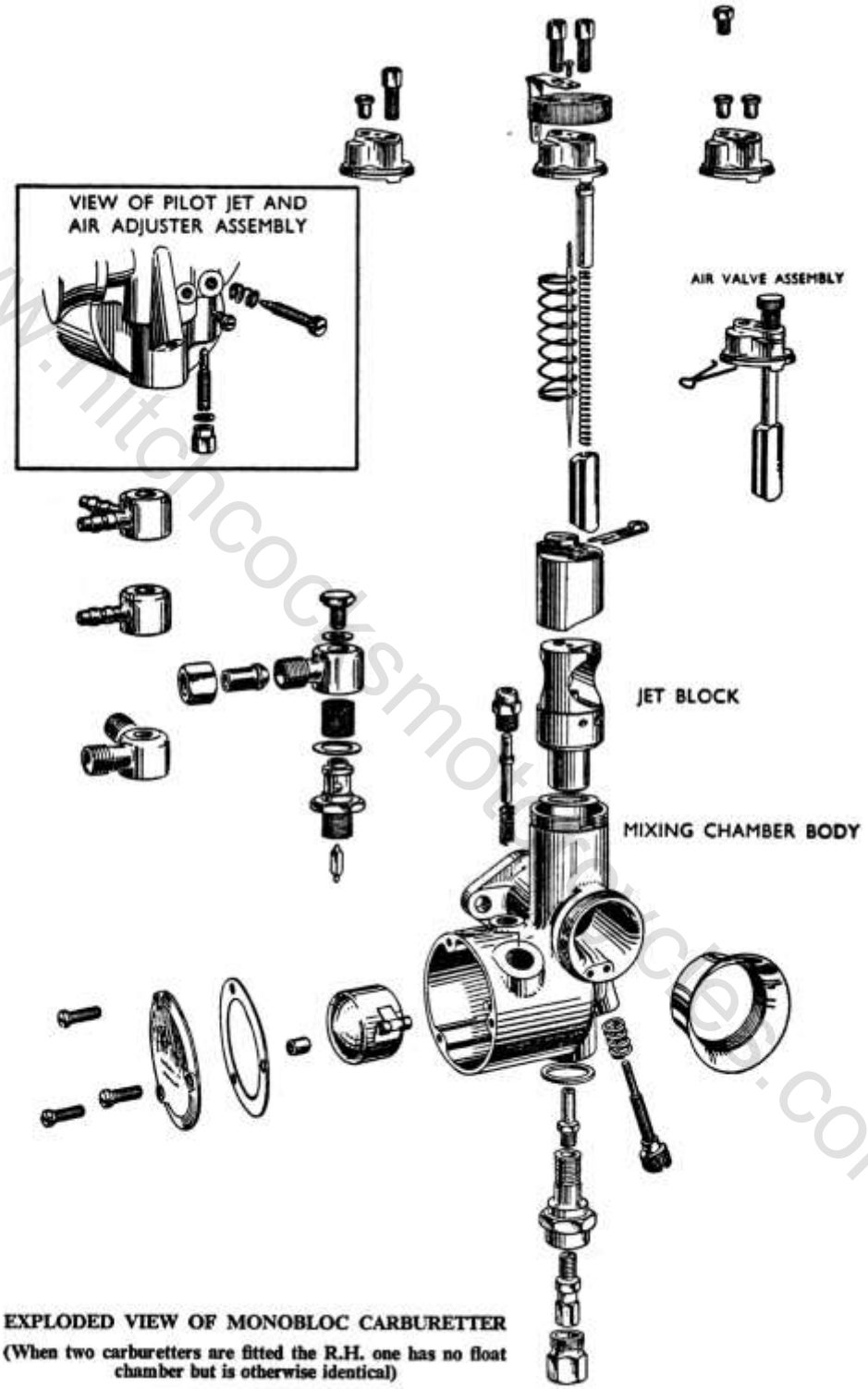
The range of adjustment of the taper needle and the pilot air screw are determined by the size of the needle jet and of the pilot outlet respectively. Standard needle jets have a bore at the smallest point of .1065 in. and are marked 106. Alternative needle jets .1055 in., .1075 in., .109 in. and .113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

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

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

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

The carburetter which supplies the left-hand cylinder has an integral float chamber which



EXPLODED VIEW OF MONOBLOC CARBURETTER

(When two carburetters are fitted the R.H. one has no float chamber but is otherwise identical)

Fig. 3

also controls the fuel supply via a connecting pipe to the right-hand instrument which does not have a float chamber in unit with it.

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

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

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

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

3. Dismantling Carburetter

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

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

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

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

4. Causes of High Petrol Consumption

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

Setting of Amal Monobloc carburetters on Royal Enfield Motorcycles

Machine	Carburetter Type Number	Choke Bore inches	Main Jet	Needle Jet	Needle Position	Throttle Valve	Pilot Jet
250 Clipper 1955 (late) - 1958 (early)	375/10	25/32	120	105	3	4	25
250 Crusader 1957 - 1962 250 Clipper late 1958 on	375/16	7/8.	120	105	3	3.1/2	25
Crusader Sports 1959 onwards and 250 Trials 1962 on	376/216	15/16	150	106	3	3.1/2	25
Super 5 1962 on and Continental (all)	376/283	1.1/16	180	106	4	3.1/2	25
Continental GT 1965 on	389/217	1 1/8	270	106	3	3.1/2	25
350 Bullet 1955 (late) - 1958 350 Clipper 1958 - 1962 Works Replica 1958 - 1961	376/29	1	180	106	3	3.1/2	25
350 Bullet 1959 - 1962	376/215	1.1/16	190	106	3	4	30
350 Bullet 1963 on	376/297	1.1/16	180	106	3	3.1/2	25
500 Bullet 1956 - 1958	389/9	1.1/8	200	106	2	3.1/2	30
500 Bullet 1959 - 1961	389/34	1.3/16	220 (250 if no air filter)	106	3	3.1/2	30
Meteor Minor 1958 - 1963	376/92	1.1/16	250	106	2	3.1/2	30
Super Meteor 1956 - 1962 Constellation 1963	376/41	1.1/16	240	106	3	3.1/2	30
Constellation 1960 - 1962	LH 376/242 RH 376/243	1.1/16	320	106	3	4	25

SECTION G1D

Lucas Rotating Magnet Magneto Model SR2

Used on 1956-59 Super Meter

1. General

The magneto rotor comprises a permanent magnet fitted with two laminated pole shoes. The stator consists of laminated pole pieces bridged by a laminated coil core. The coil has concentrically wound primary and secondary windings.

The rotor is driven by the engine through an automatic advance coupling and induces an alternating magnetic field in the laminated iron core of the coil. This field in turn induces alternating voltages in the primary and secondary windings of the coil. Magnetic flux due to current flowing in the primary winding tends to oppose any change in direction of the magnetic field in the laminated iron core. In this way, field reversals due to the rotating magnet are delayed until the contact breaker opens. This removes the restraining influence of the primary winding and the consequent rapid reversal of the magnetic flux linked with the coil causes a high voltage to be induced in the secondary winding.

The body of the magneto is formed of a single casting enclosed at the contact breaker end by a moulded cover. The cover is designed with the high tension cable outlets in a downward direction, thus preventing the retention of moisture at the terminal connections. The coil and capacitor are robustly constructed and specially treated to withstand very arduous conditions.

The automatic timing control is a centrifugally operated mechanism enabling an angular movement of the magneto rotor to occur relative to the drive. The mechanism consists of two members flexibly coupled by pivoted spring-loaded governor weights and toggles. At low engine speeds and during starting, the weights are closed and a delayed spark is produced. As the engine speed increases, the governor weights swing out and advance the rotor (and thus the cam and the spark) relative to the drive.

2. Routine Maintenance

(a) Lubrication

TAKE GREAT CARE TO PREVENT OIL OR GREASE GETTING ON OR NEAR THE CONTACTS.

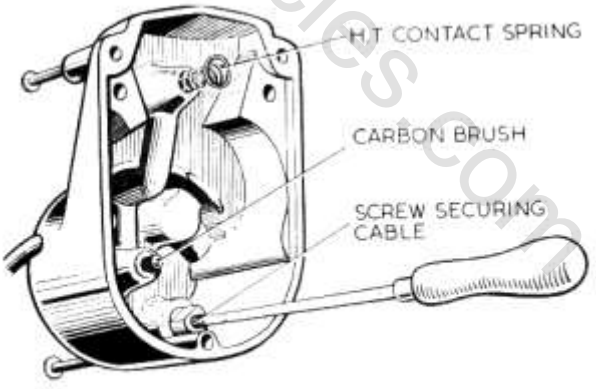
(i) After every 150 running hours (say 5,000 miles) remove the moulded cover and add a FEW drops of thin machine oil to the visible end of the contact breaker pivot post.

(ii) After 1,000 running hours (say 30,000 miles) remove the moulded cover and withdraw the rotating electrode. Slacken the fixed-contact plate securing screws and pivot the assembly to the fullest extent of the adjusting slots. Slacken the nut securing the end of the contact breaker spring and lift off the moving-contact assembly. Smear the pivot pin with a small quantity of Mobilgrease No. 2 or its equivalent. Replace the components in the reverse order of dismantling.

(iii) The magneto rotor is mounted on ball bearings. These bearings are packed with high melting point grease before leaving the factory and require no attention for a considerable time. About every two years, or when the engine is undergoing a general overhaul; the magneto should be dismantled by a Lucas Service Depot or Agent and the bearings repacked with high melting point GREASE

(b) Cleaning

(i) Occasionally remove the moulded cover and wipe the inside of the cover with a soft dry cloth.



TIGHTENING CABLE SECURING SCREW

Fig. 1

Clean the electrodes, the spaces between the electrodes and see that the carbon brush is clean and moves freely in its holder. Clean the outside of the cover before replacing it.

(ii) Examine the contact breaker. If the contacts are burnt or dirty, clean them by polishing with a very fine carborundum stone or fine emery cloth. The contacts may be cleaned more easily if the moving contact assembly is removed, as Sub-section 2 (a) (ii).

(c) Adjusting Contact Breaker

After cleaning check the gap between the contacts. Turn the engine until the contacts show the maximum opening which should measure 0.010 in. to 0.012 in. If the setting is incorrect, slacken the two screws securing the fixed-contact plate and move the plate until the correct gap is obtained. Tighten the securing screws and measure the gap again. Check the gap for the other position of the engine giving maximum opening of the contacts. Refit the distributor gear so that the marked teeth of the gear and of the drive engage, retighten the gear retaining screw.

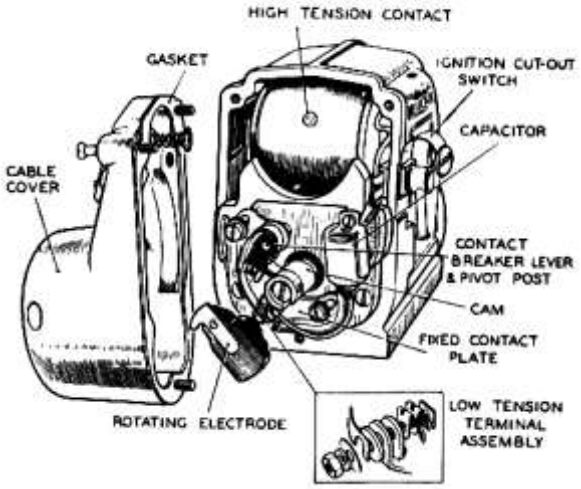
During the first 20 hours running of a new magneto or replacement contact set, most of the bedding down of the contact breaker heel occurs. The contact breaker gap should, therefore, be checked and, if necessary, reset as described above.

(d) Replacement of High Tension Cables

Use 7 mm. P.V.C. or neoprene-covered rubber insulated ignition cable for the high tension leads. When connecting a new cable to the magneto do not bare the cable but cut it off flush to the required length. Remove the moulded cover, slacken the cable retaining screw and pull out the old cable. Push the new cable fully home and secure by tightening the screw. The pointed end of this will pierce the insulation, make contact with the cable core and lock the cable in place. After fitting a high tension cable a continuity test should be made between the cover electrode and plug end of the cable.

3. Servicing

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



MAGNETO MODEL SR2 WITH COVER REMOVED
Fig. 2

(i) Remove the sparking plugs from the engine. Hold the end of each high tension cable about 1/8 in. from the cylinder block and operate the kickstarter. If strong and regular sparking is produced the sparking plugs should be cleaned and adjusted.

(ii) If no sparking is produced, examine the high tension cable and if necessary renew it as described in Sub-section 2(d).

(iii) Disconnect the cable to the cut-out switch at the magneto and re-test. If the magneto now functions normally the defect is in either the cable or the cut-out switch. Correct by replacement.

NOTE.-In no circumstances must the contact breaker cam be removed from or turned on the spindle. The cam is correctly positioned when the magneto is built and the performance of the instrument depends on this position being maintained.

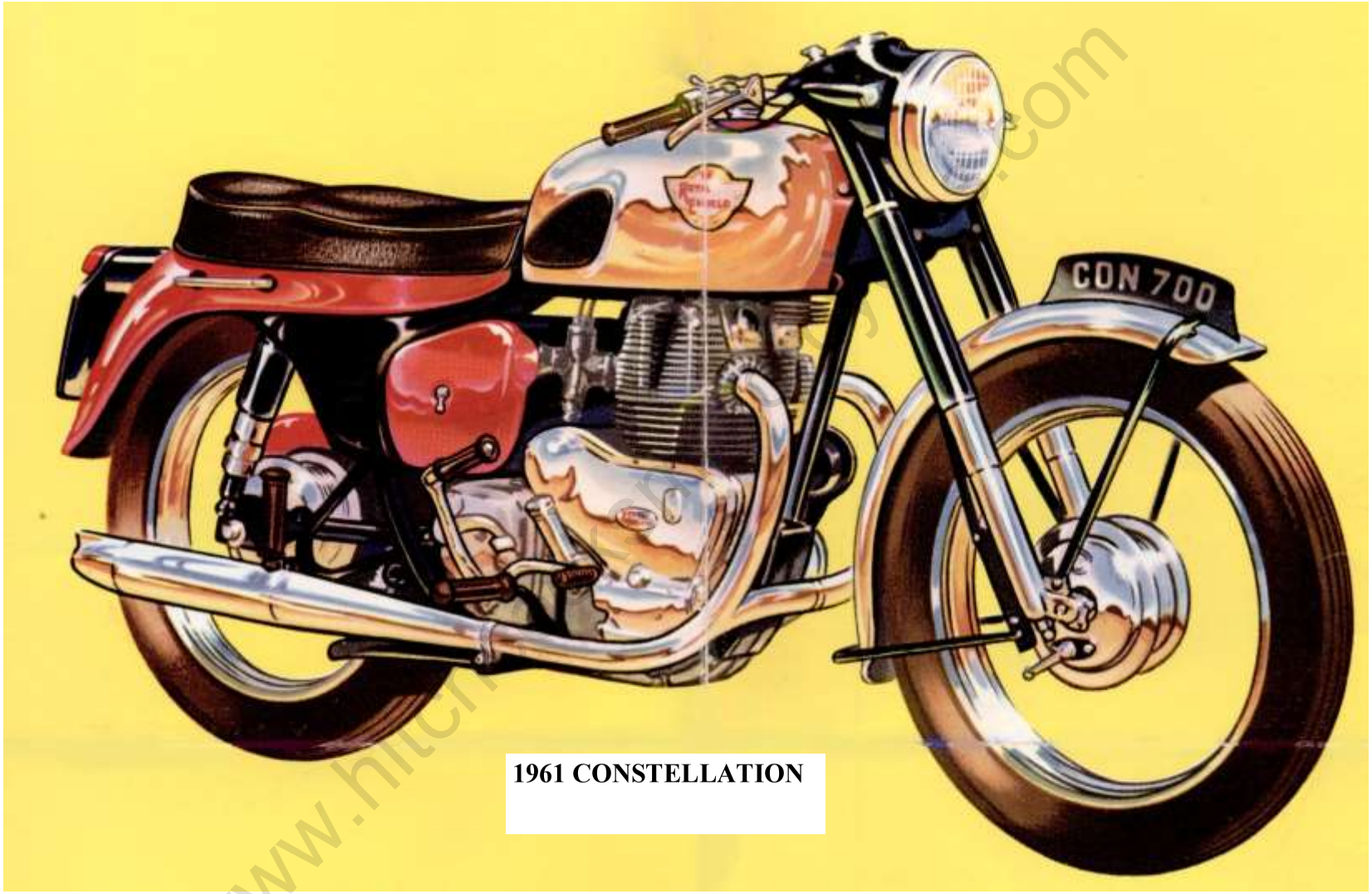
4. Automatic Advance Mechanism

This is automatically lubricated and requires no attention beyond making sure that it operates freely and the springs are securely fastened. For timing instructions see Section C4, Subsection 4.

HOW TO LOCATE AND REMEDY TROUBLE

Condition	*Possible Causes*	*Method of Detection and Remedy*
ENGINE WILL NOT START.	Controls not set correctly for starting.	See that the ignition is switched on, petrol turned on and everything is in order for starting.
	Contact breaker inoperative.	Crank the engine and check that the contact breaker opens and closes correctly.
	Contacts need cleaning and adjusting.	Clean and adjust the contact breaker as described above.
	Plugs not sparking.	Detach the high tension cables from the plugs. Hold the cables 1/8" (3.17 mm.) from the engine and see if a spark jumps the gap when the engine is cranked. (i) If a spark is produced, check the plugs by substitution. (ii) If no spark is produced, check the cables by substitution. Clean and check inside of cable cover.
	Defect in cut-out circuit.	Disconnect the remote cut-out switch and crank the engine. If the engine now starts, renew the connecting cable or switch.
	Incorrect timing.	Check the magneto-to-engine timing. (See Section C4).
ENGINE MISFIRES.	Defective fuel supply.	Inspect the carburetter, petrol supply, etc.
	Sparking plugs need cleaning and adjusting.	Remove plugs from engine. Clean off soot or carbon and check plug "points" for correct gap width (.018 in.).
	Contacts need cleaning and adjusting.	Clean and adjust the contact breaker.
	Defective high tension supply.	Check high tension cables by substitution. Clean and check inside of cable cover.

If, after making the above checks, a fault in the magneto is suspected but cannot be located, the nearest Lucas Service Depot or Agent should be consulted. When communicating with a Service Depot, it is necessary, in addition to describing the trouble, and the type and year of engine, to state the Model, Type and Service Number of the magneto.

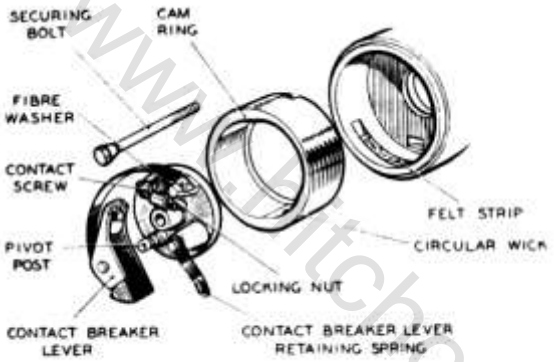


1961 CONSTELLATION

SECTION G1f

Lucas Twin-Cylinder Magneto

Models K2F (42369) and K2F (42369B)



K2F (42369) MAGNETO CONTACT BREAKER
Fig. 1

1. General

This magneto incorporates a wound rotating armature and a high-energy permanent magnet field system, this latter being cast integral with the body. The unit is designed for 3-point flange fixing.

Small breathing holes are provided in the body of the magneto. These holes should not be allowed to become blocked.

Provision is made for altering the ignition timing by the manual control method, in which the cam ring is moved relatively to the armature. The lever controlling this movement is mounted conveniently on the handlebars and is connected by a control cable to the magneto.

2. Routine Maintenance

2 (a). Lubrication

To be carried out every 3,000 miles.

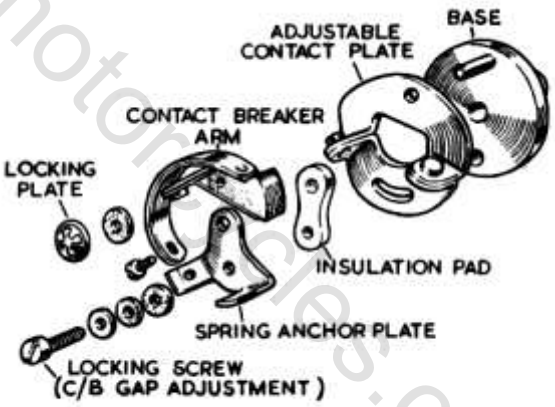
(i) Wipe out the outside of the magneto to remove dirt or grease, and then take off the contact breaker cover. Unscrew the hexagon-headed screw in the centre of the contact breaker and withdraw the contact breaker from its housing. Push aside the contact breaker arm retaining spring of the K2F (42369) type unit, and in the case of the later K2F (42369B) model, prise off the special locking plate from the contact breaker arm pivot pin, taking care not to lose the insulating washer beneath it.

Slacken the screw which retains the contact breaker arm spring. The contact breaker arm may then be lifted from its pivot.

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

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 manual timing control engage with their respective slots.

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



K2F (42369B) MAGNETO CONTACT BREAKER
Fig. 2

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, nor must undue force be used.

(ii) Bearings. The main bearings of the magneto 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 0.012-0.015 in. when the contacts are fully separated.

To adjust the gap, turn the engine until the contacts are fully opened. On K2F (42369) type magnetos the locking nut of the adjustable contact must first be slackened. Turn the contact by its hexagon head until a feeler gauge of appropriate thickness is a sliding fit in the gap. Tighten the locknut and recheck the gap. On K2F (42369B) type magnetos the cheese-headed screw which locates the spring anchor plate is slackened; the plate on which the contact is mounted may then be moved away from or towards the contact breaker arm, to give the required clearance.

(ii) Adjusting the Timing Control Cable. Slackness in the manual control timing can be taken up by sliding the waterproofing rubber shroud up the cable and turning the hexagon-headed cable adjuster. After adjusting, return the rubber shroud to its original position over the adjuster and control 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 a soft dry cloth. Each carbon brush must move freely in its holder and, if necessary, clean it with a petrol-moistened cloth. Should a brush be worn to within $^{1}/_{8}$ in. of the shoulder it must be renewed.

Whilst the pick-up moulding is 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, the high tension cable shows signs of deterioration, it must be replaced, using 7mm. rubber, P.V.C. or neoprene covered ignition 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.

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

2 (e). Renewing Timing Control Cable

The 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 Springs

Correct contact breaker spring pressure measured at the contacts is 18-24 oz.

3. Servicing

3 (a). Testing Magneto 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 end of the H.T. cable 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, examine the H.T. 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 therefore be made-by substitution.

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

(v) If the magneto has recently been replaced or removed, it may be incorrectly timed. Refer to the engine makers' instructions, and check.

(vi) Check the contact breaker for cleanliness and correct contact setting as described under Maintenance.

If the cause of faulty operation cannot be traced from the foregoing checks, the cause may be an internal defect in the magneto. The magneto should therefore be removed from the engine for dismantling.

Further ignition particulars are given in a booklet issued by the makers, a copy of which we shall be pleased to forward upon request.

SECTION G2h

Generator/Rectifier Charging Set

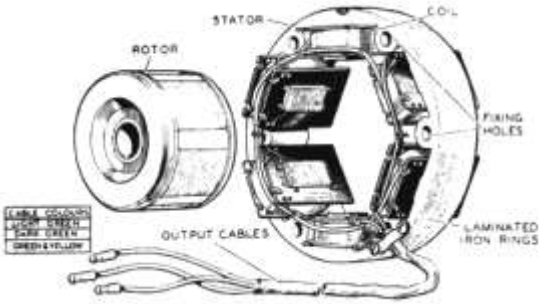
1. General

(a) Constructional Notes

The alternator consists of a spigot mounted 6-coil laminated iron stator with a rotor carried on and driven by an extension of the crankshaft. The rotor has a hexagonal steel core, each face of which carries a high energy permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to brass side plates, the assembly being cast in aluminium and machined to give a smooth external finish.

As shown in Figure 1, there are no rotating windings, commutator, brushgear, bearings or oil seals and consequently the alternator requires no maintenance apart from an occasional check of the three-way connector in the three output cables to see that this is clean and tight.

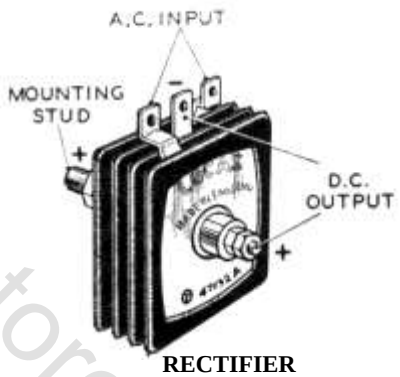
If removal of the rotor becomes necessary for any purpose, there will be no necessity to fit keepers to the rotor poles. When the rotor is removed, wipe off any metal swarf that may have been attracted to the pole tips and put the rotor in a clean place.



STATOR AND ROTOR OF ALTERNATOR RM15
Fig. 1

(b) Rectifier

A bridge-connected rectifier is fitted to convert the alternator output to a uni-directional battery charging current. The rectifier requires no maintenance apart from an occasional check to see that the connections are clean and tight. The nuts that clamp the rectifier plates together must never under any circumstances be slackened, as the clamping pressure has been carefully adjusted during manufacture to obtain the correct performance characteristics. A separate nut is used for securing the unit to the machine and this nut should be checked occasionally to see that it is tight.



RECTIFIER
Fig. 2

(c) Operation

The alternator stator is wound with three pairs of series-connected coils, one pair being permanently connected across the rectifier. The purpose of this latter pair is to provide a small trickle charging current for the battery whenever the engine is running.

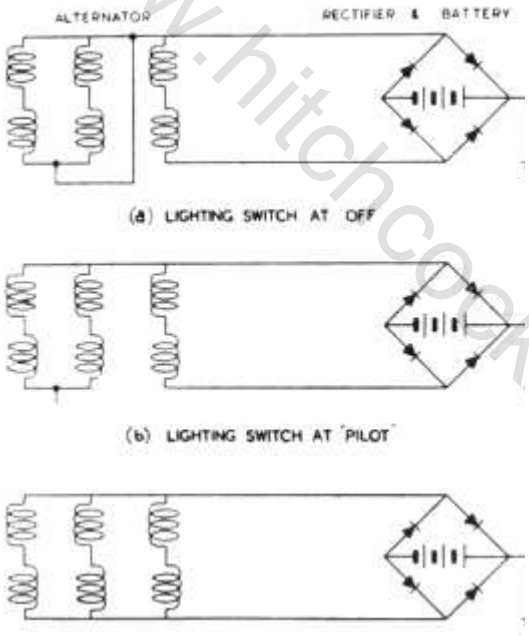
Connections to the remaining coils vary according to the demand on the battery and, as shown schematically in Figure 3, depend on the positions of the lighting switch. When no lights are in use, the coils are short-circuited and the alternator output is regulated to its minimum value by interaction of the rotor flux with the flux set up by the current flowing in the shorted coils. In the "Pilot" or parking lights position, the shorting link is disconnected and, the regulating fluxes being consequently reduced, the alternator output increases and compensates

for the parking lights load. In the "Head" position of the lighting switch, the output is further increased by all three pairs of coils being connected in parallel.

2. Maintenance

(a) Check wiring occasionally to see that all connections are clean and tight.

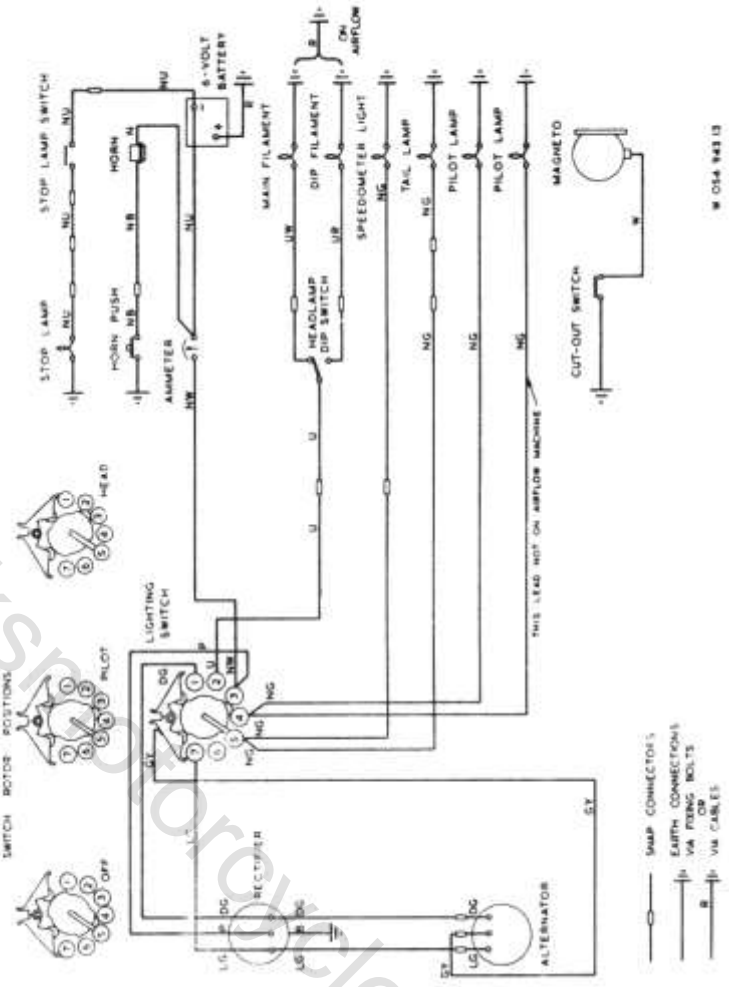
(b) Check tightness of rectifier securing nut.



INTERNAL CONNECTIONS OF ALTERNATOR

CIRCUIT DIAGRAMS FOR POSITIONS OF LIGHTING SWITCH

Fig. 3



WIRING DIAGRAM
Fig. 4

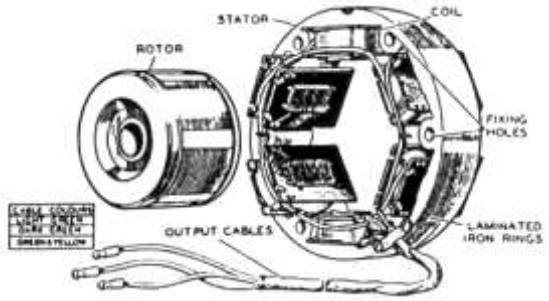
SECTION G2j
Lucas A.C. Lighting-Ignition System

1. General

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

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

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



STATOR AND ROTOR OF ALTERNATOR RM15
Fig. 1

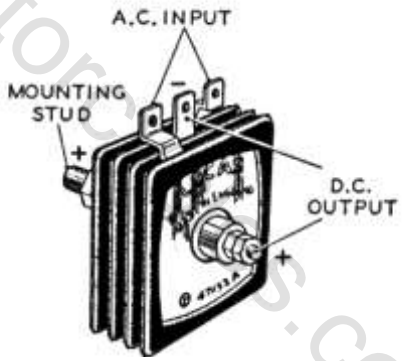
2. Alternator Models RM14 and RM15

Early models are fitted with type RM14 alternator, which has an outside diameter of 5.7/8 in. Later models are fitted with type RM15 (see Fig. 1) with an outside diameter of 5 in. They give a high output at low r.p.m. The alternator comprises two main components, a stator and a rotor. The stator is built up from iron laminations and carries three pairs of series-connected coils insulated from the laminations. The rotor has a hexagonal steel core, each face of which carries a permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to brass side plates, the assembly being cast in aluminium and machined to give a smooth external finish. The stator and rotor can be separated without the need to fit magnetic keepers to the rotor poles.

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

3. Circuit Detail

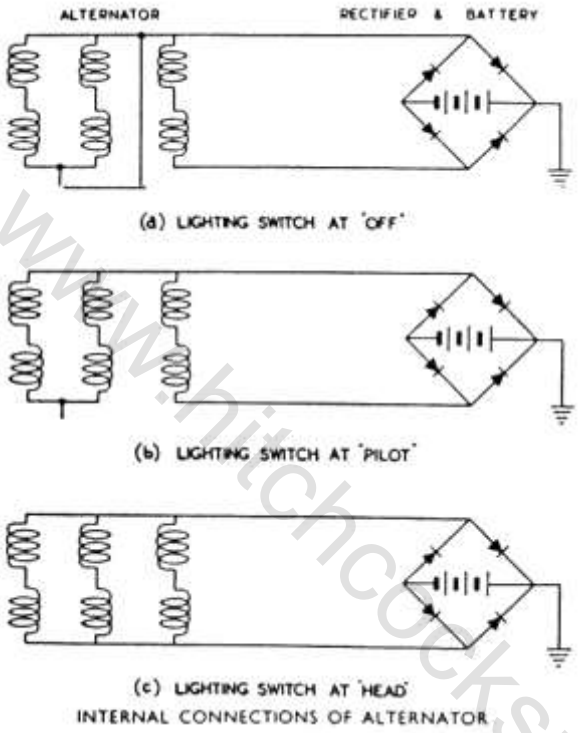
The alternator stator carries three pairs of series connected coils, one pair being permanently connected across the rectifier bridge network. The purpose of this latter pair is to provide some degree of charging current for the battery whenever the engine is running.



GENERAL VIEW OF RECTIFIER
Fig. 2

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

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



CIRCUIT DIAGRAMS FOR POSITIONS OF LIGHTING SWITCH

Fig. 3

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

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

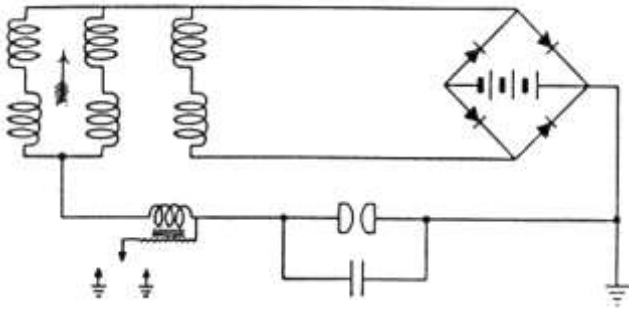
4. Emergency Starting

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

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

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

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



EMERGENCY STARTING CIRCUIT
Fig. 4

5. Direct Operation

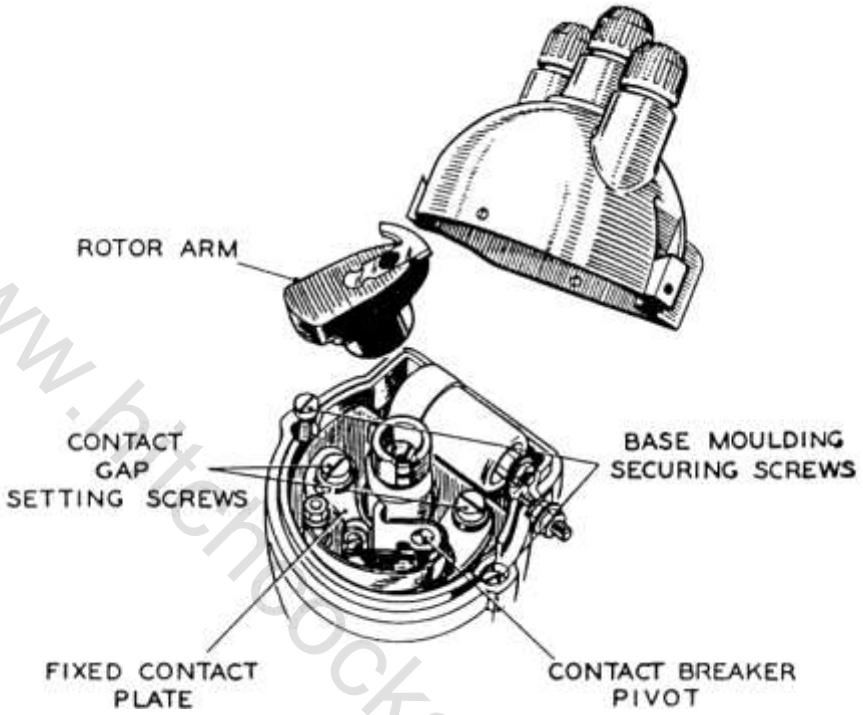
Short journeys without the battery can be made with the switch in the "EMG" position. To do this, the cable normally connected to the battery negative terminal must be connected to an earthed point on the machine. If lights are required when the battery is disconnected, use only the headlights and keep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

6. Routine Maintenance

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

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

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



DISTRIBUTOR MODEL DKX2A (early models)

Fig. 5

7. Ignition Coil Model Q6 or MA6

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

8. Distributor

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

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

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

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

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

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

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

Contact Breaker Setting. The contact breaker setting should be checked after the first 500 miles running and subsequently every 6,000 miles. To check the gap, turn the engine over slowly until the contacts are seen to be fully open and insert a 0.014-0.016 in. feeler gauge between the contacts.

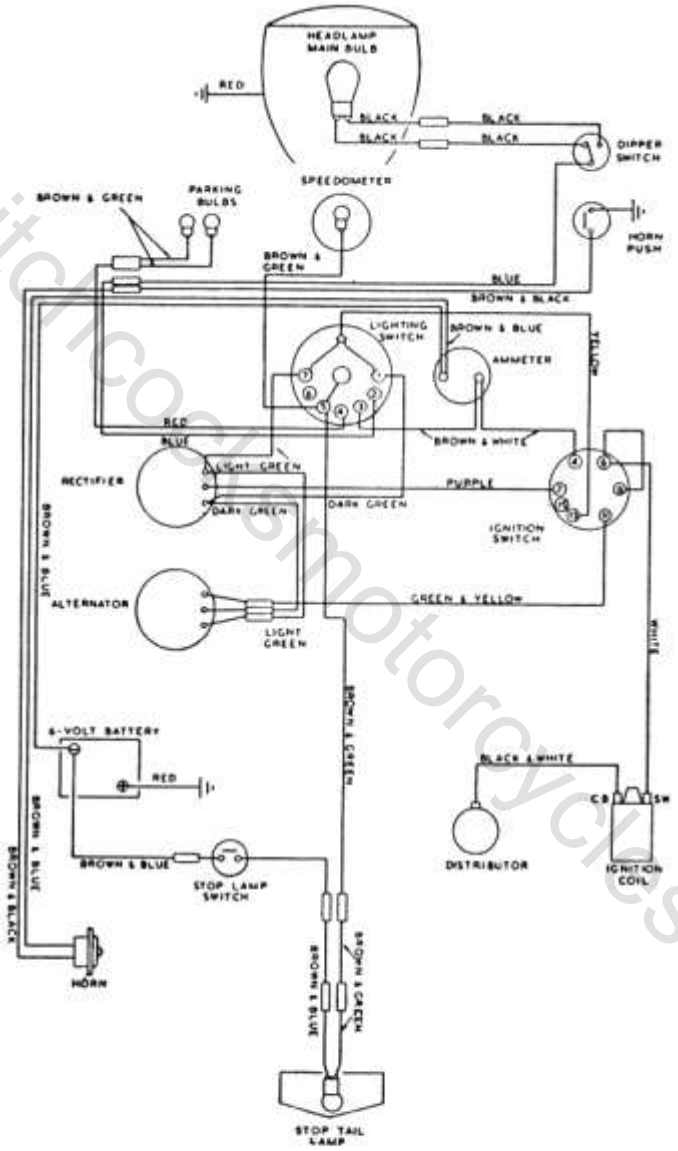
If the gap width is correct the gauge will be a sliding fit. To adjust the setting, set the engine in the position giving maximum contact opening and slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is the thickness of the gauge and tighten the two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

9. Renewing High Tension Cables

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

and moulded terminal nut from the defective cable. Thread the new cable through the moulded terminal nut and cut back the insulation for about ¼ in. Pass the exposed strands through the metal washer and bend them back radially. Screw the terminal into the pick-up moulding.

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



WIRING DIAGRAM

Fig. 6

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.

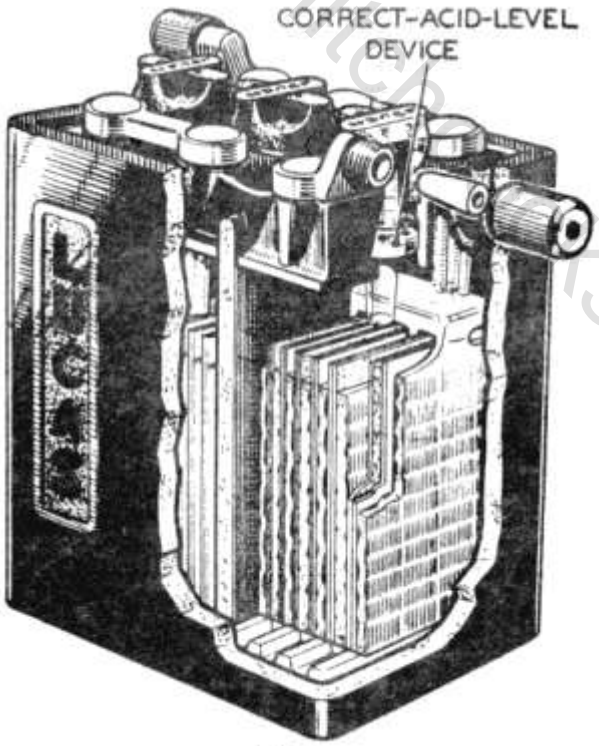


Fig. 1

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

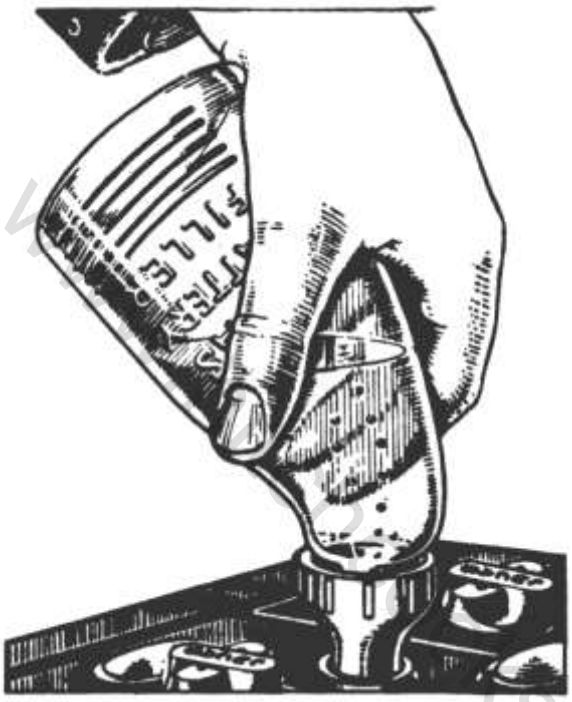


Fig. 2

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.

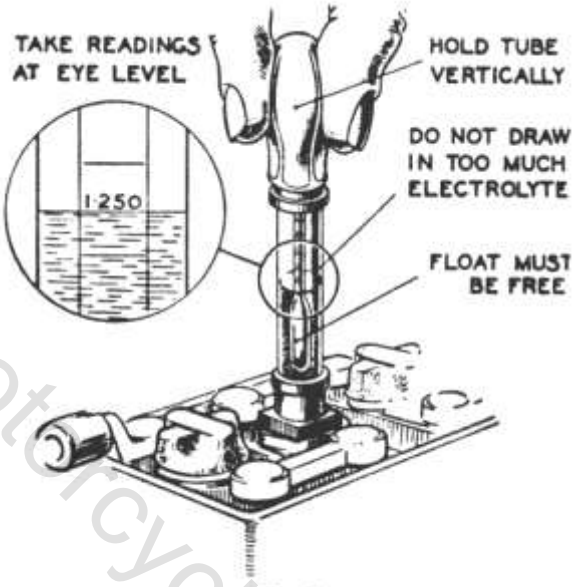


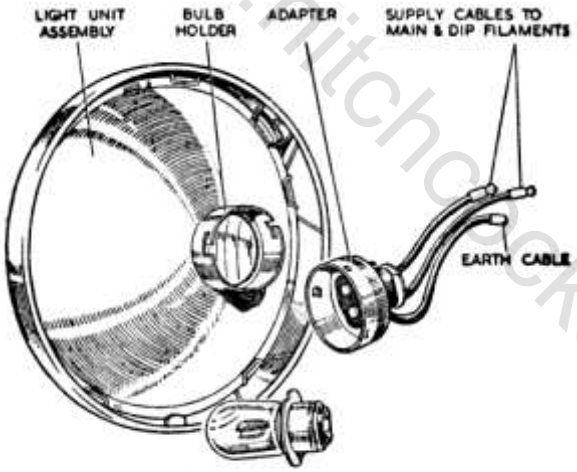
Fig. 3

SECTION G5d

Head and Tail Lamps

1. Headlamp

In all models the headlamp incorporates the Lucas Light Unit MCF 700 built into the Casquette fork head which also contains twin parking lamps as well as the ammeter and headlight switch.



HEADLAMP MCF700
Fig. 1

2. Lucas Light Unit

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

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

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

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

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

3. Replacing the Light Unit and Bulb

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

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

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

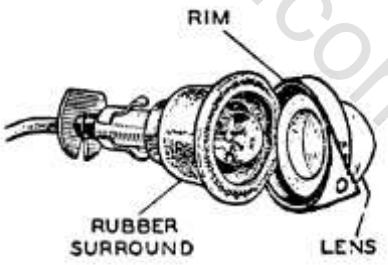
Position the new unit in the rim so that the word "TOP" on the lens is correctly located when the assembly is mounted on the headlamp. Refit the securing springs ensuring that they are equally spaced around the rim.

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

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

4. Parking Lights

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



PARKING LIGHT
Fig. 2

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

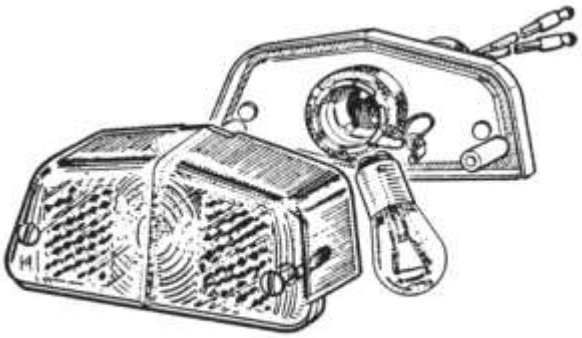
5. Tail Light

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

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

The correct bulb is Lucas No. 352, 6 volt, 3/18 watt for machines up to 250 c.c., or Lucas No. 384, 6 volt, 6/18 watt for larger capacity machines. The 3 or 6 watt filament provides the normal tail light, while the 18 watt filament is illuminated on movement of the brake pedal.

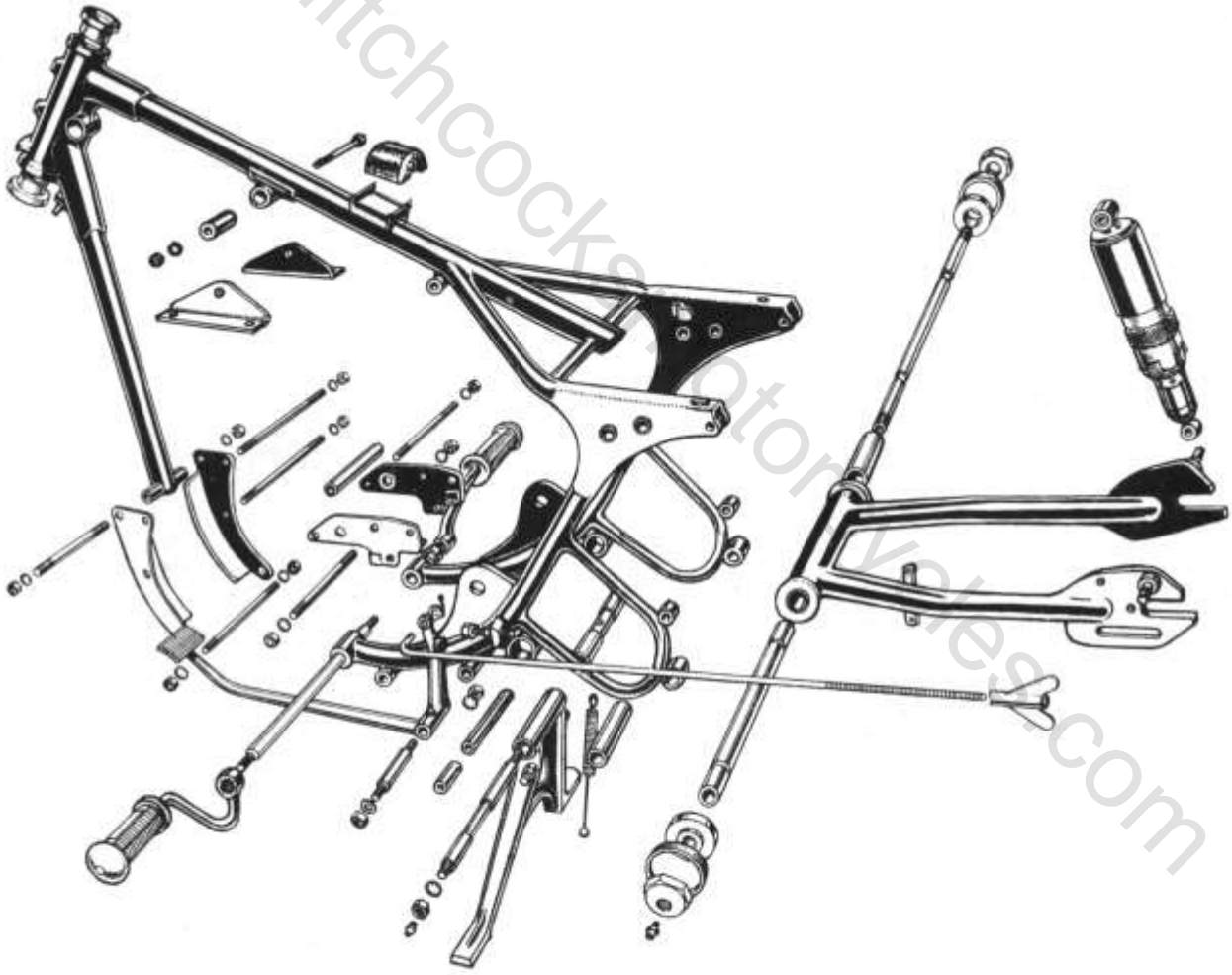
Care must be taken that the leads to the stop tail lamp are correctly connected, as the use of the 18 watt filament on the normal tail light will not only discharge the battery but could cause trouble from excessive heat affecting the plastic cover. At the same time, the 6 watt filament, if used as a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



STOP-TAIL LAMP L.564
Fig. 3

SECTION H5

Frame



EXPLODED VIEW OF "CONSTELLATION" FRAME

Fig. 1

1. Description of Frame

The frame is built throughout of cold drawn weldless steel tubing with brazed or welded joints, liners being fitted where necessary for extra strength. All the main frame members are made of 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 fitted with large diameter phosphor bronze bushes and pivots on a stout steel tube which is secured to the main frame by a long bolt passing through the pivot lugs. Hardened steel thrust washers are provided to deal with side thrust. The torsional rigidity of the swinging arm unit helps to maintain the rear wheel upright in the frame and thus relieves the wheel spindle of bending stresses to which it is subject with other types of rear suspension.

2. Steering Head Races

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

3. Removal of Rear Suspension unit

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

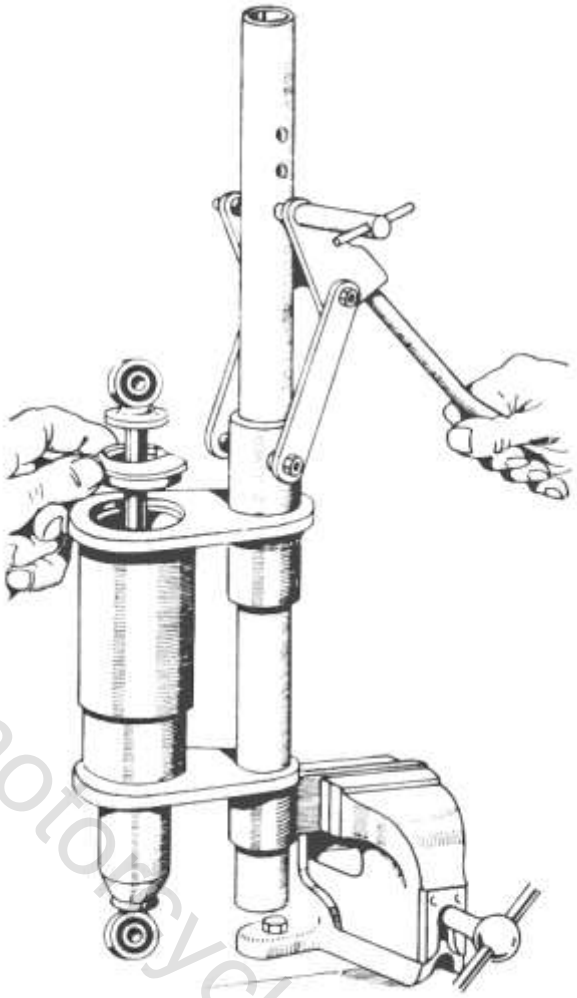
The procedure for all models is then as follows: Remove the top pivot pin nut, drive out the pivot pin, then hinge the suspension unit back on the lower pivot pin. After removing the lower nut, the unit may be pushed off the pivot pin welded to the fork end.

4. Servicing Rear Suspension Units

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

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

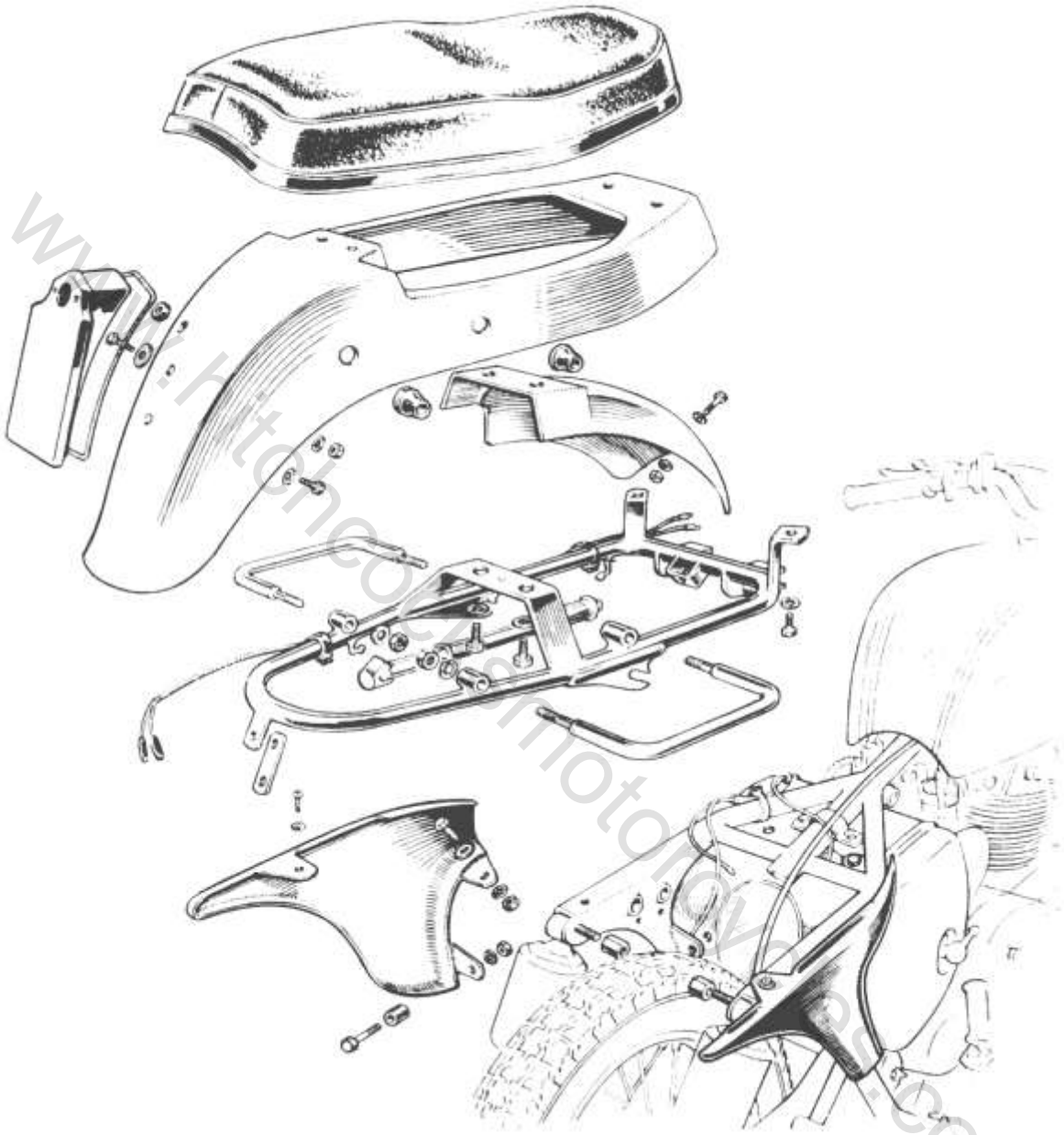
The standard solo springs have a rate of 100 - 105 lb. per inch and it is not difficult to compress these by hand. Heavier springs having a rate of 130 lb. per inch are available which may require the use of a spring compressor, as shown in Fig. 2.



REAR SPRING COMPRESSOR
Fig. 2

5. Removal of Swinging Arm Chain Stays

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



DUAL SEAT – MUDGUARD ASSEMBLY 1961 ONWARDS

Fig. 3

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

6. Centre Stand

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

7. Wheel Alignment

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

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

8. Lubrication

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

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

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

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

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

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

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

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

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

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

SECTION J1

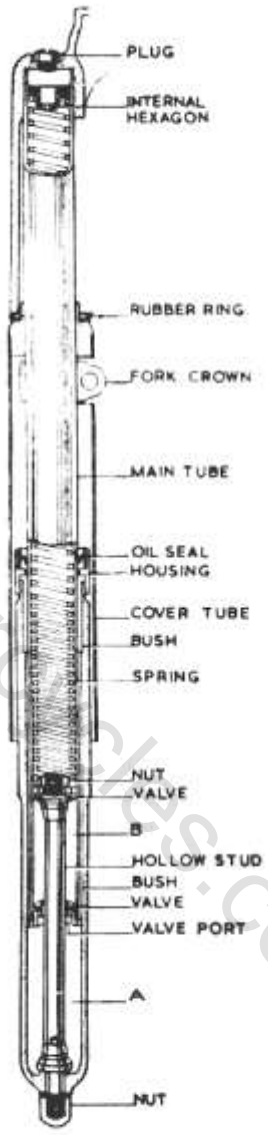
Front Fork

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 means of a threaded housing which contains an oil seal. A stud known as the "spring stud" is fitted in the lower end of the bottom tube and a valve port is secured to the lower end of the main tube. As the fork operates oil is forced between the spring stud and the bore of the valve port forming a hydraulic damping system. A compression spring is fitted inside the main tube between the upper end of the spring stud and the upper end of the main tube. The lower end of the main tube and upper end of the bottom tube are protected by a cover secured to the fork crown.

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.



SECTION OF FORK LEG

Fig. 1

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 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. 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

MAIN TUBE SPANNER

Fig. 2

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

MAIN TUBE SEAL GUIDE

Fig. 3

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 means 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.

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 steel bushes are finish ground to size after fitting on to the tubes so as to ensure concentricity to the main tube. 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 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.

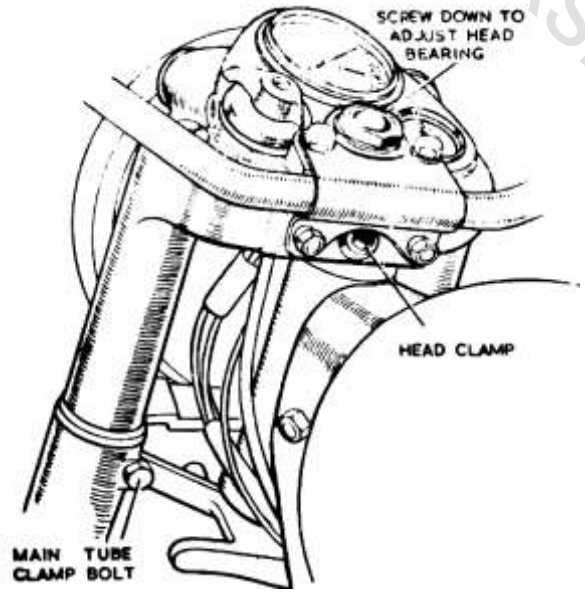
4. Spring

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

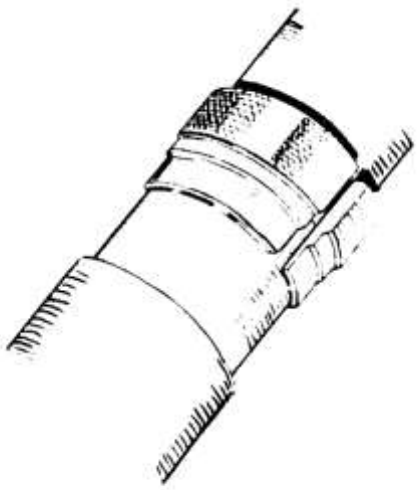
When refitting the oil seal, or fitting a new one, great care must be exercised not to damage the synthetic rubber lip which forms the actual seal. If the seal has been removed from the upper end of the main tube and is refitted from this end a special nose piece (Fig. 3) must be fitted over the end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



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

Fig. 4



OUTER COVER CENTRALISING BUSHES

Fig. 5

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 K6

Front Wheel
With Dual 6in. Brake

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

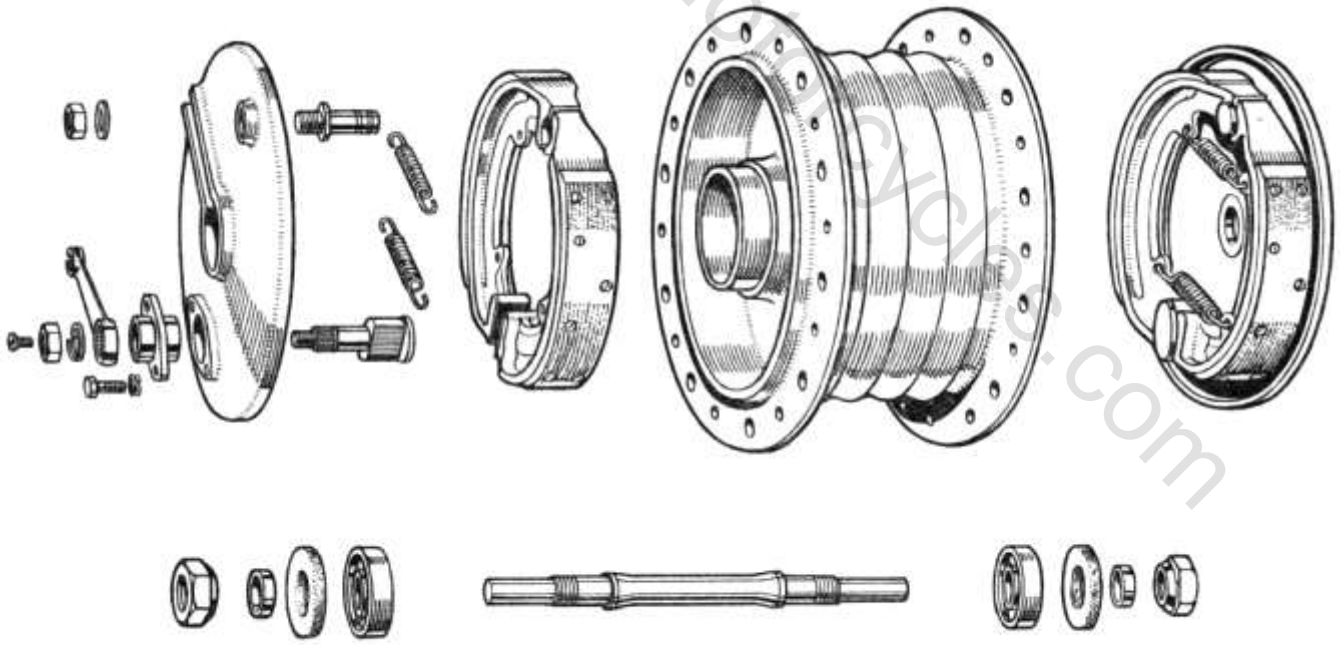
Lock the brake "on" by pressure on the operating lever, 38905 (R.H.) or 38906 (L.H.), and unscrew the cover plate nuts 31347. The right and left hand cover plate assemblies can then be withdrawn from the respective brake drums.

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, see Fig. 2. The return springs, 29236, can then be unhooked from the spring posts in the brake shoes thus allowing the whole assembly to fall apart.

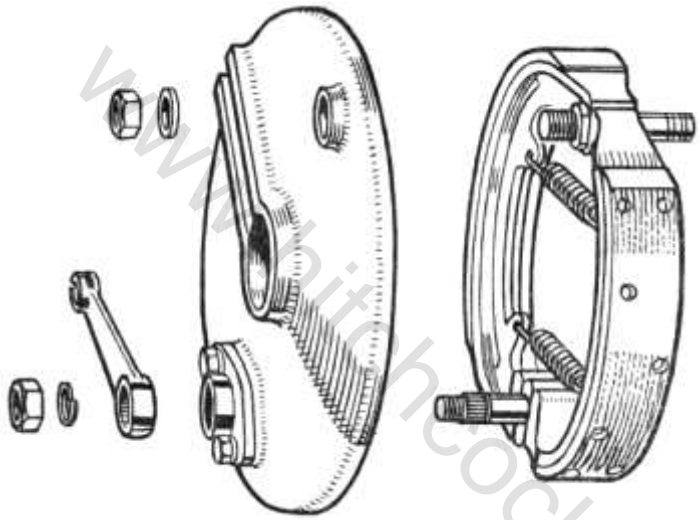
4. Replacing Brake Linings

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



DUAL FRONT BRAKE
Fig. 1

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.



REMOVAL OF BRAKE SHOE ASSEMBLY
Fig. 2

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 washers, 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.

6. Hub Bearings

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

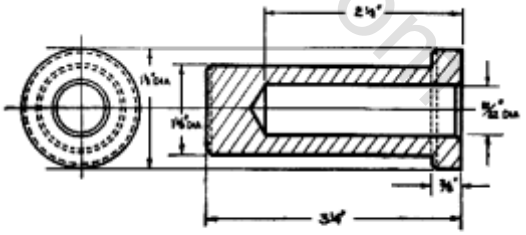
7. Fitting Limits for Bearings

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	0.6252/0.6247 in.
Shaft diameter	0.6252/0.6248 in.

8. Refitting Ball Bearings

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 30538, and the cover plate nuts, 31347, with either the cover plates themselves or additional packing washers behind the nuts. Tightening the nut 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 cage the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.



DRIFT FOR REFITTING BEARINGS
Fig. 3

9. Reassembly of Brake Shoes to 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 renders 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 centred 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 5/16in. 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 $6\frac{5}{8}$ 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 run-out both sideways and radially being plus or minus 1/32in.

15. Tyre

The standard tyre is Dunlop 3.25-19in. 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 240lb.

17. Lubrication

No grease nipple is provided on later hubs. due to the tendency to over-grease, resulting in grease finding its way past the felt seal; on to the brake linings.

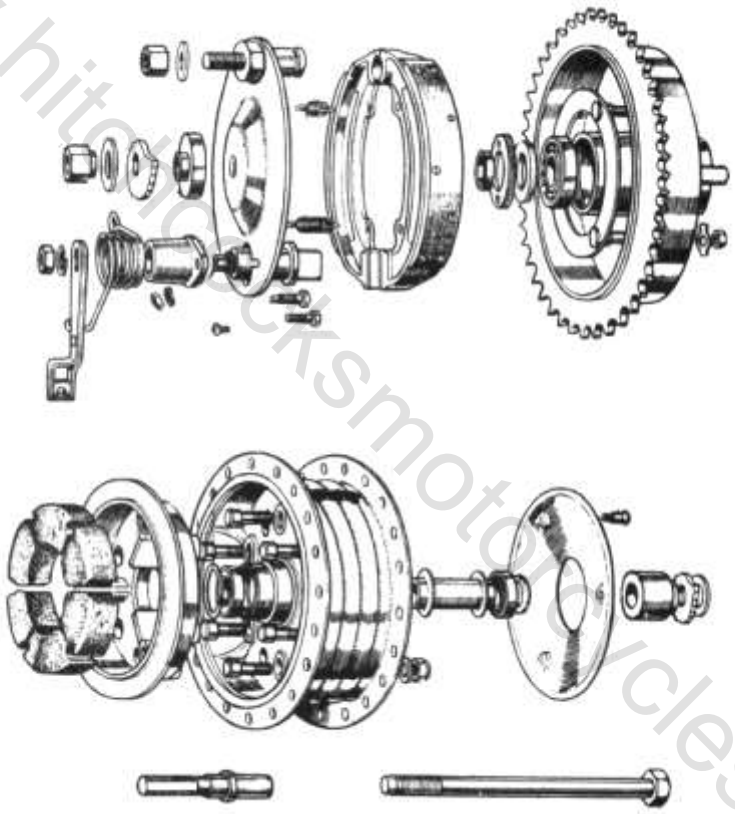
The correct method of lubrication is to pack the bearings with grease after dismantling the hub, as described above.

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 L9

Rear Wheel

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



EXPLODED VIEW OF QUICKLY DETACHABLE REAR HUB

Fig. 1

1. Description

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

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

Place the machine on the centre stand, if necessary putting packing pieces beneath the legs of the stand to lift the wheel clear of the ground. Unscrew the loose section of the spindle and withdraw this, together with the chain

adjuster cam, preferably marking it to ensure that it is replaced in the same position. Now slide the distance collar out of the fork end and lift away the speedometer drive gearbox, which can be left attached to the driving cable. The spacing collar and the felt washer behind it may now be removed to prevent risk of them falling out when manipulating the tyre. If, however, these are too tight a fit in the hub to come out easily they may be left in place. The main body of the wheel can now be pulled across to the right-hand side of the machine, thus disengaging the six driving pins from the cush drive shell and enabling the wheel to be removed from the machine.

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

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

Place the machine on the centre stand and remove the rear mudguard unit. Disconnect the rear driving chain at the spring link and loop the top end of the chain over the tag provided at the top of the fixed portion of the chaincase. Pull on the other end of the chain and allow it to hang. Unscrew the rear brake rod adjusting nut completely and depress the brake pedal so as to disengage the rod from the trunnion in the brake operating lever. Unscrew the brake cover plate anchor nut and remove this together with the washer behind it. Unscrew the loose section of the spindle two or three turns and the spindle nut by a similar amount. Mark the chain adjuster cams to ensure replacing in the same position.* Disconnect the speedometer driving cable and slide the wheel out of the fork ends, 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.

* 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.

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

4. Removal of Brake Shoes for Replacement.

Remove the complete wheel as described above, then remove the spindle nut, chain adjuster and the distance collar, thus permitting the complete brake cover plate assembly, with operating cam, pivot pin, shoes and return springs, to be lifted off the hub spindle. The brake shoes can then be removed after detaching the return springs. Brake linings for alloy shoes, are supplied either in pairs ready drilled complete with rivets (Part No. 4246913X) or ready fitted to service replacement brake shoes (Part No. 41342SR). When riveting linings to shoes, secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MS3, which are drilled to receive cheese headed rivets.

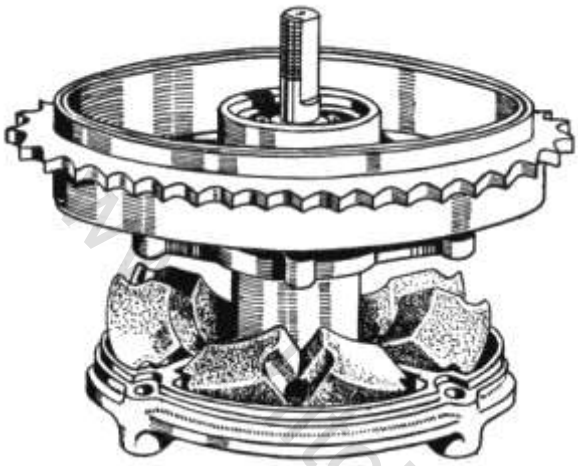
5. Removal of Brake Operating Cam

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

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

6. Cush Drive

The sprocket brake drum is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar vanes are formed on the cush drive shell. Six rubber blocks are fitted between the vanes on the brake drum and those on the cush drive shell, thus permitting only a small amount of angular movement of the sprocket/brake drum relative



RE-ASSEMBLY OF CUSH DRIVE
Fig. 2

to the hub barrel and transmitting 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 ½ in. to 1 in., the rubbers should be replaced. To obtain access to them remove the complete wheel as described above; then unscrew the loose section of the spindle completely. The main portion of the wheel can then be lifted away from the assembly consisting of the fixed portion of the spindle, sprocket/brake drum complete with brake and the cush drive shell. Now remove the brake cover plate complete with brake shoes as described above, and unscrew the three nuts at the back of the cush drive shell after bending back the locking washers. The three studs are brazed to the lockring and should be driven out of the cush drive shell, each a little at a time to avoid distorting the lockring or bending the studs. The sprocket/brake drum can now be separated from the cush drive shell, and the six cush drive rubbers lifted out.

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

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

7. Removal of Ball Bearings

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

To remove the bearings from the loose half of the hub barrel, first lift away the distance collar, speedometer drive gearbox, the spacing collar and the felt washer. Remove the bearing retaining circlip from the driving sprocket end of the barrel. Between the two bearings is a spacer, slotted at one end to enable a drift to be used on the bearing at that end. Remove this bearing first, then enter the loose section of the spindle into the spacer and drive out the remaining bearing by means of a hammer and drift applied to the hexagon headed end of the spindle.

8. Hub Bearings

These are deep-groove Single-row journal ball bearings. The sprocket/brake drum bearing is a Skefko RLS7, 7/8 in. i/d, by 2 in. o/d, by 9/16 in. wide. Equivalent bearings of other makes are Hoffmann LS9, Ransome & Marles LJ 7/8 in., and Fischer LS9. The two bearings in the hub barrel are Skefko RLS5, 5/8 in. i/d, by 1.9/16 in. o/d, by 7/16 in. wide. Equivalent bearings of other makes are Hoffmann LS7, Ransome & Marles LJ 5/8 in., and Fischer LS7.

9. Removal of Hub Driving Pins

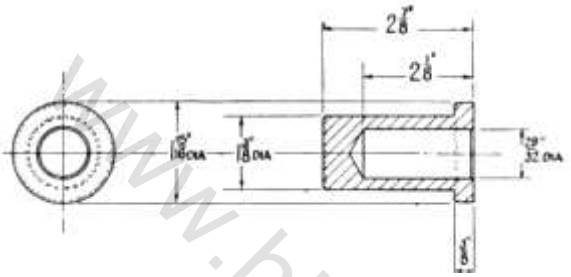
To remove the six driving pins from the aluminium full width hub, first remove the hub cap after unscrewing the three screws attaching it to the hub. Unscrew the six Simmonds nuts and drive out the pins.

10. Refitting Ball Bearings

To refit the sprocket/brake drum bearing, use a hollow drift as shown in Fig. 3. The bearing is first fitted to the fixed section of the spindle; the spindle and bearing are then entered into the sprocket/brake drum and driven home, preferably under a press or using light hammer blows.

The two bearings in the hub barrel are pressed in, using the drift part of E.4823. First

assemble the bearing into the circlip grooved end of the barrel and fit the circlip. Replace the bearing spacer, the slot in the spacer can be at either end of the hubs, and assemble the second bearing, supporting the hub on the inner race of



DRIFT FOR RE-FITTING BEARING
Fig. 3

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

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

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

12. Centering Cam Housing

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

13. Final Reassembly of Hub Before Replacing Wheel

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

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

14. Wheel Rim

The wheel rim is type WM2-19 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.

15. Spoke

The spokes are of the single butted type, 8-10 gauge, with 90º countersunk heads, thread diameter .144 in., 40 threads per inch, thread form British Standard Cycle. The inner spokes are 6.5/8 in. long with an angle of bend 100º, and the outer spokes 6.3/4 in. long with an angle of bend 80º. One security bolt is fitted. There is also a balance weight clipped to a spoke by means of a small screw.

16. Wheel Building and Truing

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

17. Tyre

The standard tyre is Dunlop 3.50-19 in. studded tread.

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

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

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

18. Tyre Pressures

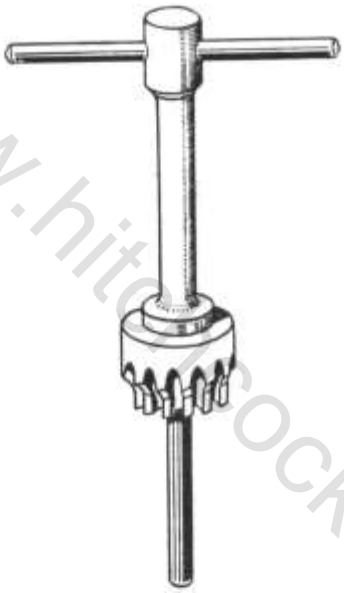
The recommended pressures for the rear tyre are 20 lb. per sq. in. for a solo rider and 32 lb. per sq. in when a pillion passenger is carried.

19. Lubrication

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

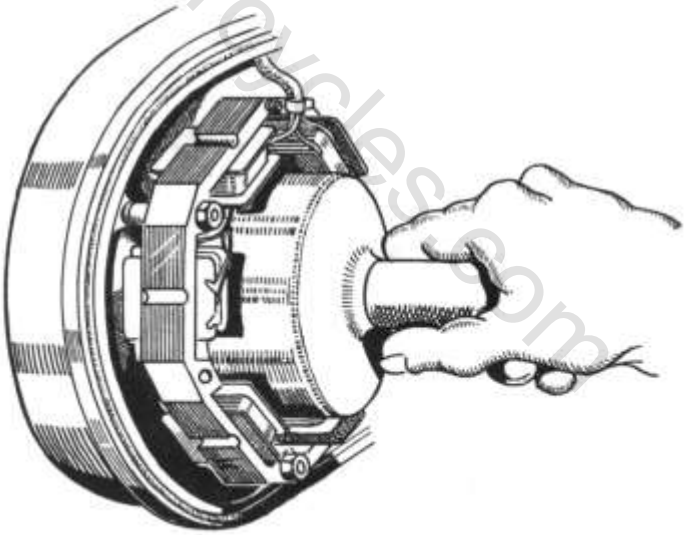
Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further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

SECTION M6
Special Tools



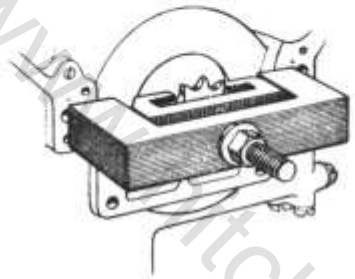
INLET VALVE SEAT ARBOR
T.2053 all models

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

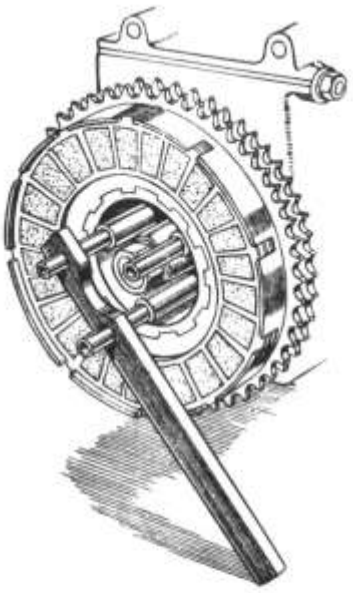


ASSEMBLY GAUGE IN USE TO CENTRALISE ROTOR

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



E.4869
TIMING SPROCKET EXTRACTOR



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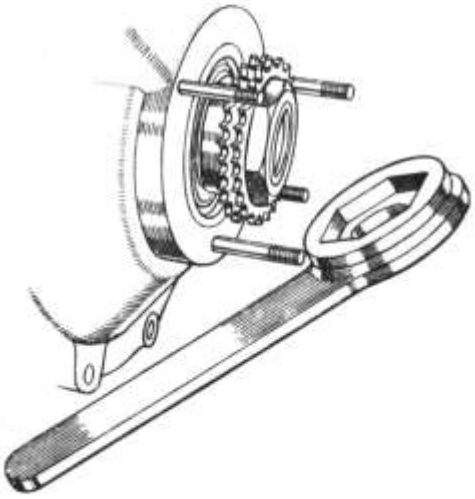
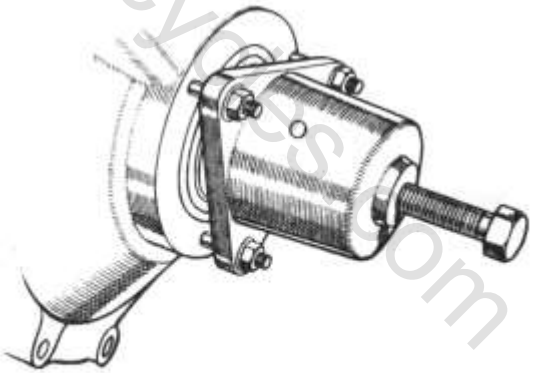
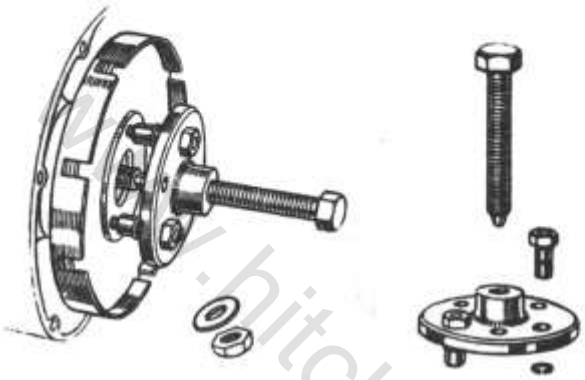
CLUTCH HOLDING TOOL



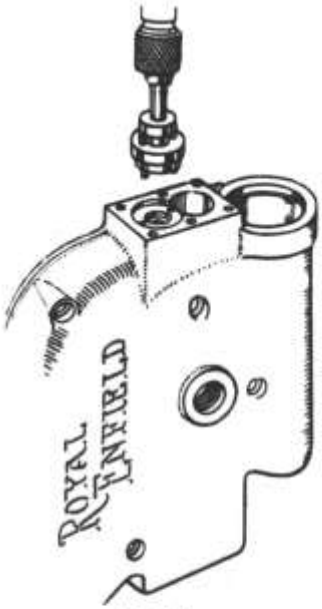
E.4877
ENGINE SPROCKET NUT SPANNER



E.5121
CRANKSHAFT EXTRACTOR



E.5414
CLUTCH HUB EXTRACTOR



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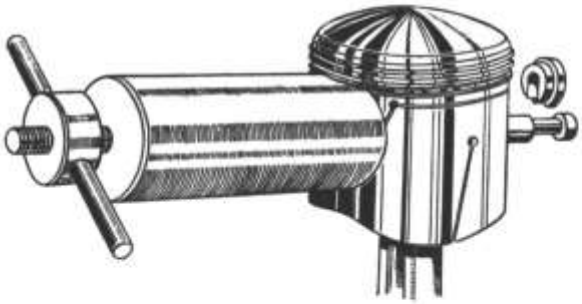
PUMP DISC LAPPING TOOL



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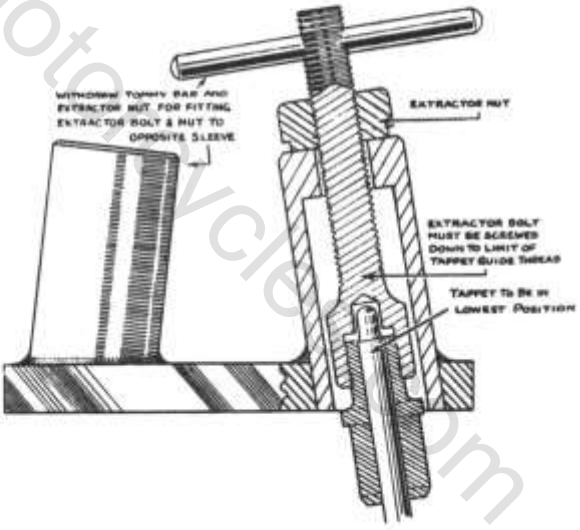
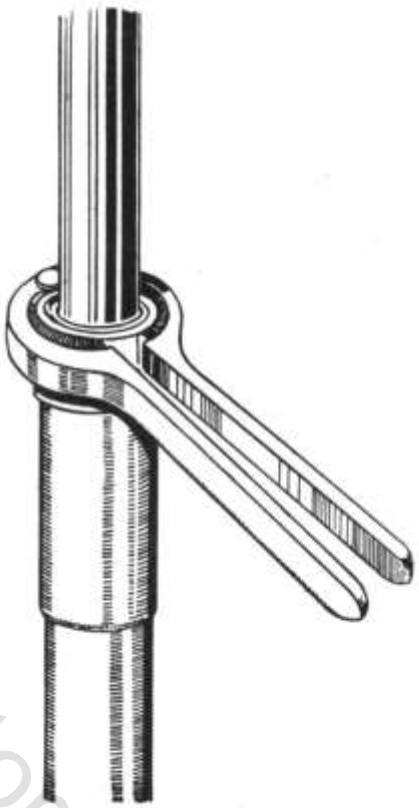
GUDGEON PIN EXTRACTOR

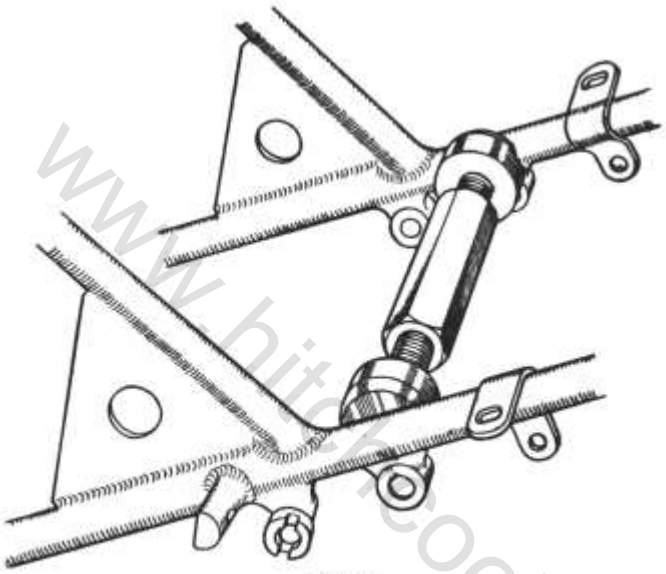


E.5790
TAPPET GUIDE EXTRACTOR

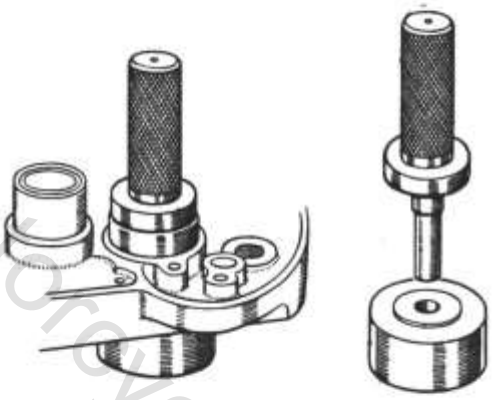
E.5418
LOCKRING SPANNER



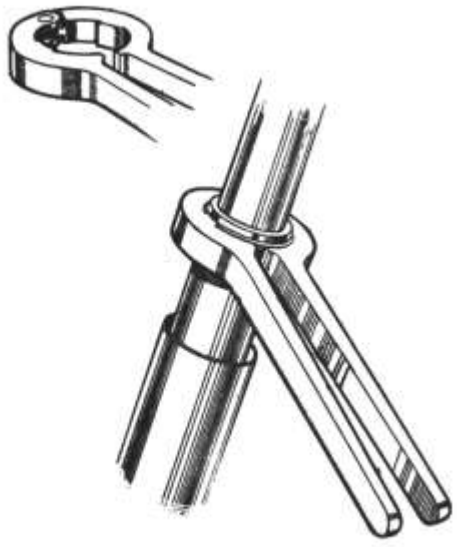
E.4912
OUTER TUBE HAND GRIPS



E.5431
FRAME EXPANDER



E.4823
GEARBOX COVER BALL BEARING



E.5417
GLAND NUT HAND GRIPS

SECTION PI

"Airflow" Fairing

1. Description of the Fairing

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

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

2. Removal of the windscreen

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

3. Removal of the Headlamp

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

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

4. Removal of the Headlamp Switch, Speedometer and Ammeter

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

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

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

5. Removal of the Front Wheel and Fork Legs

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

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

6. Removal of the Front Mudguard

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

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

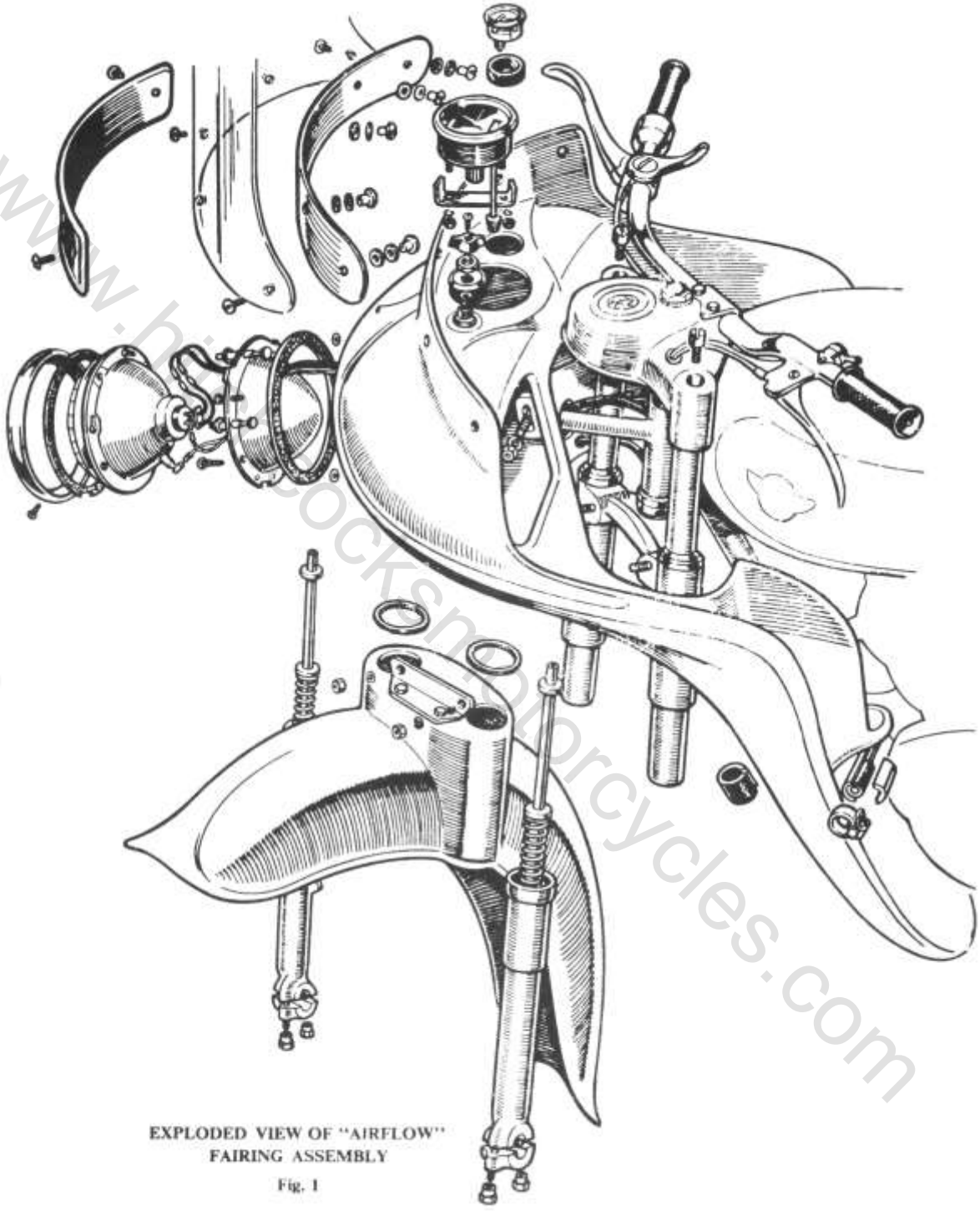
7. Removal of the Fairing

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

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

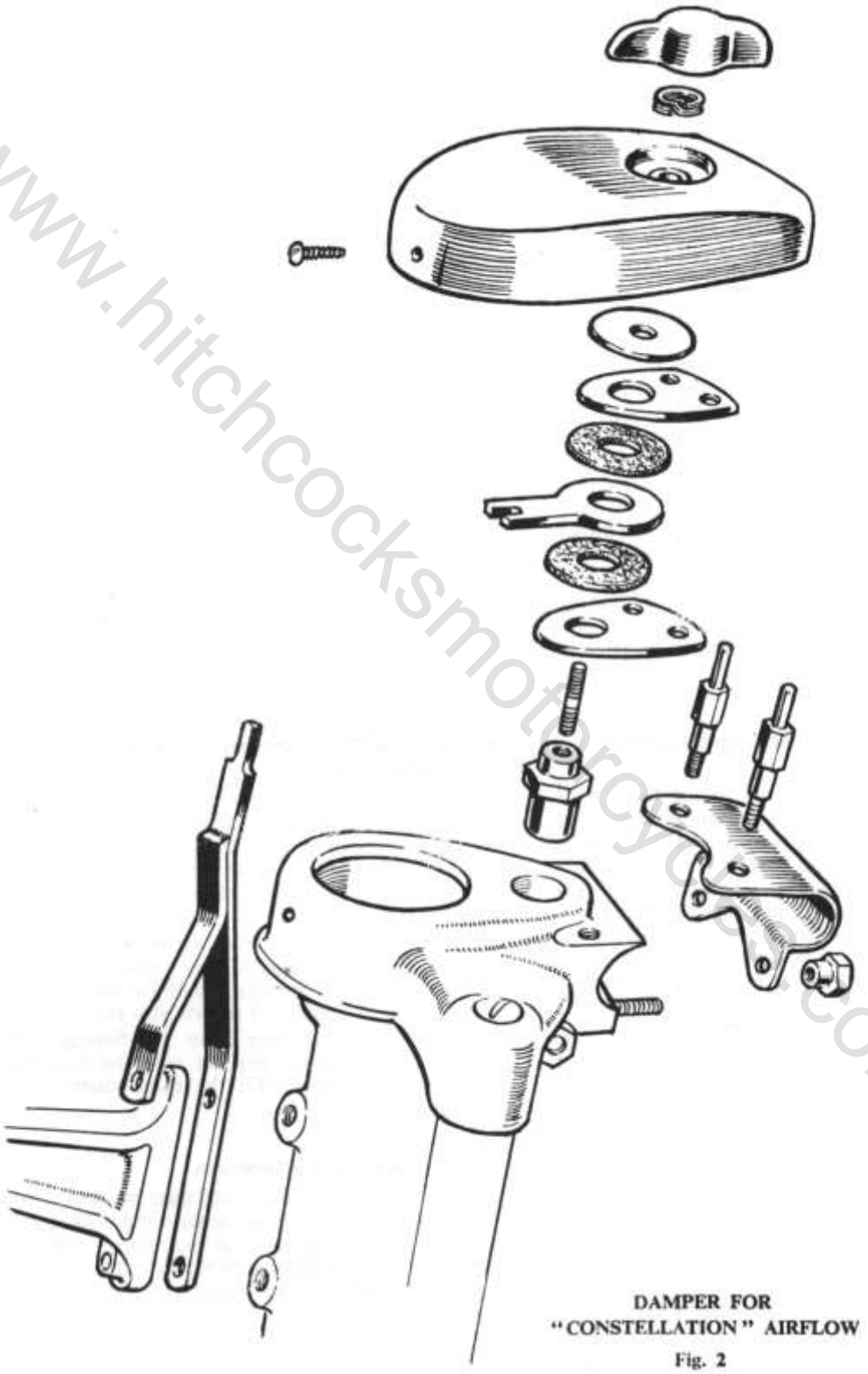
Unscrew the nuts and push out the stud which secures the upper part of the fairing to the tube extending forward from the steering head.

If required the two bottom attachment studs may be removed.



EXPLODED VIEW OF "AIRFLOW" FAIRING ASSEMBLY

Fig. 1



DAMPER FOR
"CONSTELLATION" AIRFLOW
Fig. 2

8. Repairs

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

9. Reassembly of the Fairing

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

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

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

10. Reassembly of Mudguard, Fork Legs and Wheel

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

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

The fork crown clip bolts may now be tightened.

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

11. Reassembly of Headlamp

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

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

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

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

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

12. Reassemble of Ammeter, Headlamp Switch and Speedometer

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

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

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

13. Reassembly of Windscreen

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

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