

# MAINTENANCE MANUAL

AND

# INSTRUCTION BOOK

FOR

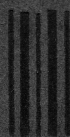
THE UNAPPROACHABLE

# Norton

REGD. TRADE MARK

## MOTOR CYCLE

## MODELS 16H, BIG 4 & 18



Telephones :  
ASTon Cross 0776-7-8  
(Private Branch Exchange)

**NORTON MOTORS LIMITED**  
**BRACEBRIDGE STREET**  
**BIRMINGHAM, 6**  
**ENGLAND.**

Telegrams :  
"Nortomo"  
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# INDEX.

	Paragraph				Paragraph
Ammeter	96	Legshields			80
Battery, maintenance	97	Legshields, fitting			81
Big End, examination	33	Lubrication System			1
Brakes, dismantling	61	Magdyno, removal			32
Brakes, assembling	62	Magdyno, fitting			32
Carbon, removal	10	Magneto, lubrication			86
Carburetter, adjustment	78	Magneto, timing			27
Carburetter, maintenance	79	Main Bearings, removal			36
Carburetter, dismantling	73	Main Bearings, fitting			37
Carburetter, assembling	74	Oil Bath Chaincase, removal			41
Carburetter, easy starting	76	Oil Bath Chaincase, fitting			42
Carburetter, float chamber	77	Oil Circulation			5
Carburetter, slow running	75	Oil Control Valve			31
Carburetter, throttle stop	76	Oil Filter			2
Contact Breaker, adjustment	87	Oil Level			4
Contact Breaker, cleaning	88	Oil Pump			3, 30
Clutch, dismantling	43	Oil Pump, removal			28
Clutch, examination	44	Oil Pump, fitting			29
Clutch, assembly	45	Petrol Tank, removal			6
Crankcase, dismantling	35	Petrol Tank, fitting			7
Crankcase, assembling	38	Piston, removal			22
Cylinder Barrel, removal	11, 12	Piston, fitting			23
Cylinder Barrel, fitting	17, 18	Piston Ring, removal			22
Cylinder Head, removal	8, 12	Rocker Box, removal			12
Cylinder Head, fitting	9, 18	Rocker Box, dismantling			19
Dynamo Brushes	92	Rocker Box, fitting			18
Dynamo, lubrication	94	Small End Bush, removal			24
Dynamo, removal	92	Small End Bush, fitting			24
Dynamo, fitting	92	Sparking Plug, maintenance			91
Electrical Cables	100	Speedometer, removal			63
Electrical System, maintenance	85	Speedometer, fitting			64
Engine, removal	34	Tail Lamp			99
Engine, fitting in frame	39	Tappet Adjustment			20, 21
Foot Change, dismantling	54	Timing Gears, removal			28
Foot Change, assembling	55	Timing Gears, fitting			29
Front Forks, removal	65	Timing Gear Bushes			40
Front Forks, dismantling	67	Timing Panel, removal			25
Front Forks, assembling	68	Timing Panel, fitting			26
Front Forks, fitting	66	Tyres, maintenance			82
Gearbox, removal	46	Tyres, removal			83
Gearbox, dismantling	48, 50, 51	Tyres, fitting			84
Gearbox, assembling	49, 52, 53	Valves, removal			13
Gearbox, fitting	47	Valves, grinding			14
Handlebar Levers	69, 70, 71, 72	Valves, fitting			15
Head Lamp	98	Valve Guides, removal			16
Head Lamp Switch	101	Valve Guides, fitting			16
High Tension Lead	89	Voltage Control Unit			95
High Tension Pickup	90	Wheels, removal			56, 58
Horn	102	Wheels, fitting			57
Hubs, dismantling	59				
Hubs, assembling	60				

# DATA.

Model.	Big 4.	16 H.	18.
Cubic Capacity ....	.... 633 c.c. ....	.... 490 c.c. ....	.... 490 c.c.
Bore ....	.... 82 m/m ....	.... 79 m/m ....	.... 79 m/m
Stroke ....	.... 120 m/m ....	.... 100 m/m ....	.... 100 m/m
Compression Ratio ....	.... 4.5 - 1 ....	.... 4.9 - 1 ....	.... 6.6 - 1
Sparkign Plug ....	.... K.L.G. M.80	.... K.L.G. M.80	.... K.L.G. F.70
<b>Ignition Timing.</b>			
Before top, fully advanced	.... $\frac{3}{8}$ " ....	.... $\frac{7}{16}$ " ....	.... $\frac{5}{8}$ "
Magneto Points, gap	.... .012" ....	.... .012" ....	.... .012"
Plug Points, gap	.... .015" ....	.... .015" ....	.... .015"
<b>Valve Timing.</b>			
Inlet opens before top	.... $\frac{3}{8}$ " ....	.... $\frac{9}{32}$ " ....	.... $\frac{5}{16}$ "
Exhaust closes after top	.... $\frac{8}{8}$ " ....	.... $\frac{9}{32}$ " ....	.... $\frac{5}{16}$ "
<b>Tappet Clearance Cold.</b>			
Inlet ....	.... .004" ....	.... .004" ....	by letter Q. Both push rods to be free to rotate.
Exhaust ....	.... .006" ....	.... .006" ....	
<b>Amal Carburetter.</b>			
Type ....	.... 276 A.T. ....	.... 276 A.T. ....	.... 276 A.U.
Main Jet ....	.... 160	.... 170	.... 160
Throttle Valve ....	.... 6/5	.... 6/4	.... 6/4
Needle Position ....	.... Middle	.... Middle	.... Middle
<b>Piston Clearances.</b>			
Top of Skirt ....	.... .0075" ....	.... .0067" ....	.... .0085"
	.... .0065" ....	.... .0057" ....	.... .0075"
Bottom of Skirt ....	.... .0055" ....	.... .0047" ....	.... .0055"
	.... .0045" ....	.... .0037" ....	.... .0045"
Engine Sprocket, Solo ....	.... 19 tooth ....	.... 19 tooth ....	.... 20 tooth
Engine Sprocket, Sidecar	.... 17 tooth ....	.... 17 tooth ....	.... 18 tooth
Gear Ratios, Solo ....	4.9, 5.93, 8.67, 14.6		.... 4.66, 5.64, 8.24, 13.84
Gear Ratios, Sidecar ....	5.46, 6.62, 9.66, 16.22		.... 5.16, 6.25, 9.14, 15.3
Petrol Tank Capacity ....	.... $3\frac{1}{4}$ gallons	.... approximate	.... $2\frac{3}{4}$ galls. approx.
Oil Tank Capacity ....	4 pints approximate		
Gearbox Capacity ....	$\frac{1}{2}$ pint approximate		
Chaincase Capacity ....	$\frac{1}{2}$ pint approximate		
Tyre Pressures ....	Front 16lbs.	Rear 24lbs.	

# INTRODUCTION.

In preparing these instructions the elementary details and preliminary information that may be necessary to the absolute novice has been omitted, on the assumption that the majority of NORTON owners are already acquainted with the elementary details of starting, driving and maintenance. In connection with the latter we would stress the advisability of cultivating the habit of routine cleaning, lubrication, examination and adjustment of your machine. By this means many minor annoyances will be avoided and major breakdowns averted, and you will acquire the pride of ownership which marks the true enthusiast.

Below is a plan view of the machine with all controls clearly indicated. A short study of this will familiarize you with the position and function of each control. Without wishing to become elementary a description of the best method of ensuring an easy start may not be inappropriate. With the petrol turned on, the air lever partly closed and the ignition lever in about its middle position, slightly flood the carburetter until petrol seeps (not drips) from the bottom of the carburetter mixing chamber and turn the easily starting screw (Fig. 20) in a clockwise direction. Depress the kickstarter until the resistance of compression is felt, raise the exhaust valve lifter and depress the kickstarter a further two or three inches. Release the exhaust valve lifter and allow the kickstarter to return to its normal position. Give a long swinging kick on the starter, carrying it as far round as possible. With the controls correctly set the engine should now start up.

When taking over a new machine it is only necessary to add petrol and oil to the respective tanks before use; the lubrication points having received the necessary greasing at the Works. It is advisable, however, to see that the steering damper and fork shock absorber are slackened off and to adjust these to your particular requirements.

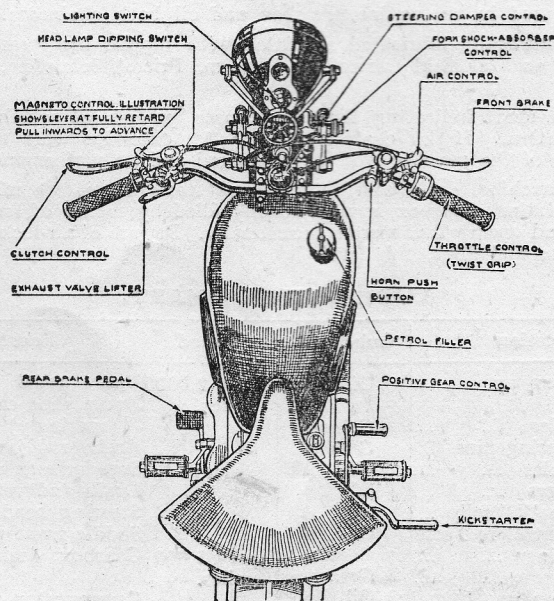


Fig. 1. Plan of machine showing controls.

New machines should not be driven at more than 35 miles per hour for the first 500 miles in top gear or a correspondingly slower speed in the lower gears. Avoid "over revving" and slogging or labouring of the engine. It is advisable during the running in period not to open the throttle more than  $\frac{1}{4}$  to  $\frac{1}{3}$ . The use of running-in compound during the initial stages of the engine's life is strongly recommended. The compound, several brands of which are available and may be obtained from all NORTON agents, contains "colloidal graphite," which forms a graphoid surface on all working surfaces of the engine and greatly assists in preserving their high quality finish. The compound should be mixed with the lubricating oil in the proportion of one pint to each gallon during the running-in, but if its use is continued after this period only half the quantity should be used.

Under all usual circumstances when the machine is travelling at 25 miles per hour or over the air lever should be fully open and the ignition fully advanced, and only during starting or when the engine shows a tendency to pink should the ignition be retarded. Remember that these are high efficiency engines which give of their best when running at relatively high revolutions, and do not be afraid to change into a lower gear at the first signs of labouring. We would stress that the highest possible use should be made of the gearbox, which is quite capable of withstanding all the loads likely to be imposed on it by normal usage.

At the end of this book will be found a trouble tracing chart, reference to which will greatly facilitate the locating and rectifying of any but the most unusual troubles which may be likely to cause an involuntary stop.

## LUBRICATION.

At the Works, Wakefield Castrol Oils have been used for many years exclusively with highly successful results; the correct grades for the models dealt with in this handbook being:—

WAKEFIELD CASTROL XXL, for Summer use.  
WAKEFIELD CASTROL XL, for Winter use.

Other very suitable oils for NORTON machines are:—

PRICES' MOTORINE "B" DE LUXE or TRIPLE SHELL, for Summer use.  
PRICES' MOTORINE "C" or DOUBLE SHELL, for Winter use.

These oils should be used in the engine, gearbox and oil bath chaincase.

All bearings not automatically lubricated are fitted with nipples for grease gun lubrication, and a good quality grease, such as Wakefield Castrol Medium, Prices' Belmoline, or Shell Retinax, should be used at these points.

Below is a lubrication chart indicating the approximate periods at which the various lubrication points should receive attention. If this chart is adhered to, excessive wear will not occur on any of the moving parts, the life of the machine will be prolonged and its performance considerably enhanced.

NOTE.—On a new machine, drain and flush out oil tank after 500 miles. Remove crankcase drain plug and allow to drain. Gearbox is most readily filled by means of an oil gun; if oil is poured in, allow plenty of time and operate kickstarter occasionally. Beware of air-locks. Remove level indicator plug from oilbath chaincase and fill to this level.

### LUBRICATION CHART.

Period	Location	Lubricant	Period	Location	Lubricant
Every 200 miles.	Oil tank, top up ....	Oil	Every 2,000 miles.	Brake pedal ....	Grease
Every 1,000 miles.	Fork spindles ....	Grease		Brake shoe cams (sparingly) ....	Grease
	Rebound spring pins ....	Grease		Brake rod jaw joints ....	Oil
	Control cables ....	Oil		Speedometer driving box	Grease
	Control levers ....	Oil		Drain and refill oil tank	Oil
	Brake cable "U" clip ....	Oil		Steering head races ....	Grease
	Gearbox control rod pins	Oil		Saddle front pivot ....	Oil
	Wheel bearings ....	Grease	Every 5,000 miles.	Gearbox, drain and refill	Oil
	Rear chain ....	Grease		Commutator end bracket	Oil
	Gearbox, top up ....	Oil			
	Every 2,000 miles.	Oil bath, top up ....	Oil	Every 10,000 miles.	Oilbath, drain and refill
Footchange lever ....		Grease			

# THE ENGINE.

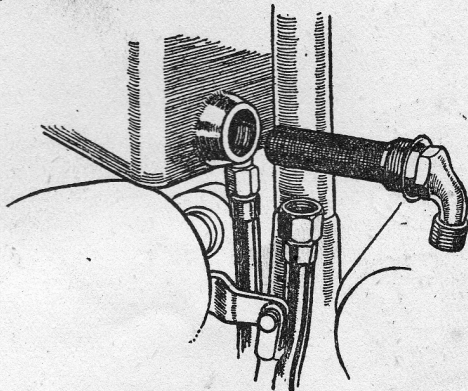
## 1. ENGINE. LUBRICATION SYSTEM.

This is of the dry sump type. The oil flows from the oil tank to the pump by gravity, assisted by suction from the feed side of the oil pump, through the gears, and is forced under pressure to various parts of the engine, drains to the lowest part of the crankcase—that is the sludge trap—and by suction from the return side of the pump is lifted back to the oil tank.

## 2. THE FILTER.

The only filter in the oil system is of the gauze type and is fitted on the feed side of the oil circuit, attached to the adaptor screwed into the oil tank, to which the feed pipe is connected.

Clean filter, when oil tank is drained, every 2,000 miles.



OIL TANK FILTER. (Fig 2.)

## 3. ENGINE OIL PUMP.

This is of the gear type. The pump contains two pairs of gears, one on the feed side and the other on the return side.

The gears on the return side are twice the width of those on the feed, having twice the pumping capacity. This ensures that the crankcase is free from oil when the engine is running.

To check the return of the oil to the tank, remove the oil filler cap. The oil return pipe can then be seen. After the engine has been running for a few minutes, the oil return flow will be spasmodic, due to the greater capacity of the return gears.

## 4. OIL LEVEL.

The oil level in the oil tank should not be above three-quarters and not below half.

If the level is above the three-quarter mark, when the engine is running, the pressure built up in the oil tank by the oil return side of the pump will force the surplus oil through the air release pipe on to the road.

Always run engine for a few minutes before checking oil level. It is possible when an engine has been idle for any length of time for the oil to syphon through the return gears to the sump.

When this happens, all the oil is returned to the tank in the first few minutes that the engine is running.

When the oil level is below the half full mark there is such a small quantity of oil that it tends to over-heat.

## 5. THE CIRCULATION OF THE OIL.

The oil is forced from the pump,

1. To the rear wall of the cylinder.
2. To the big-end bearing.
3. To the pressure control valve.

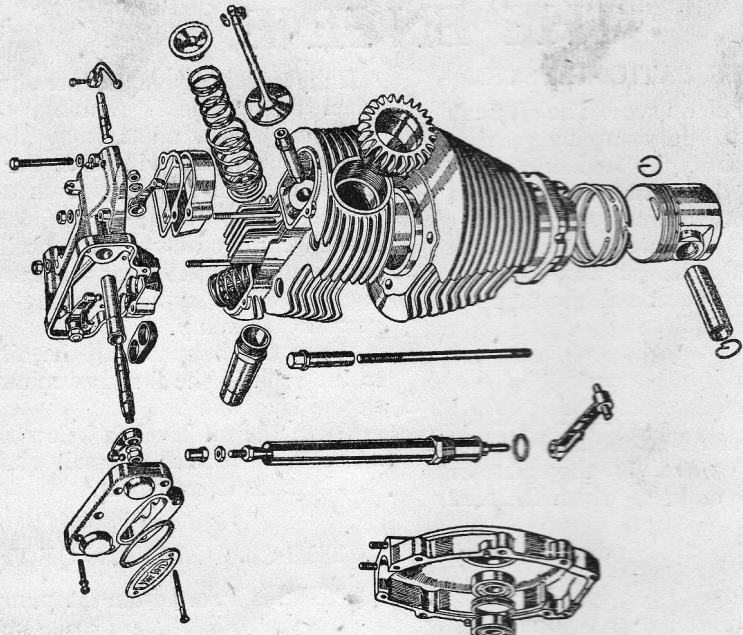
1. The oil passes through the timing panel to the mouth of the crankcase, through the base of the cylinder, up the cylinder wall and feeds the rear of the cylinder and piston.

2. The oil passes down the timing panel through the big end restriction jet, along the timing shaft, up the flywheel and is sprayed on to the roller big-end.

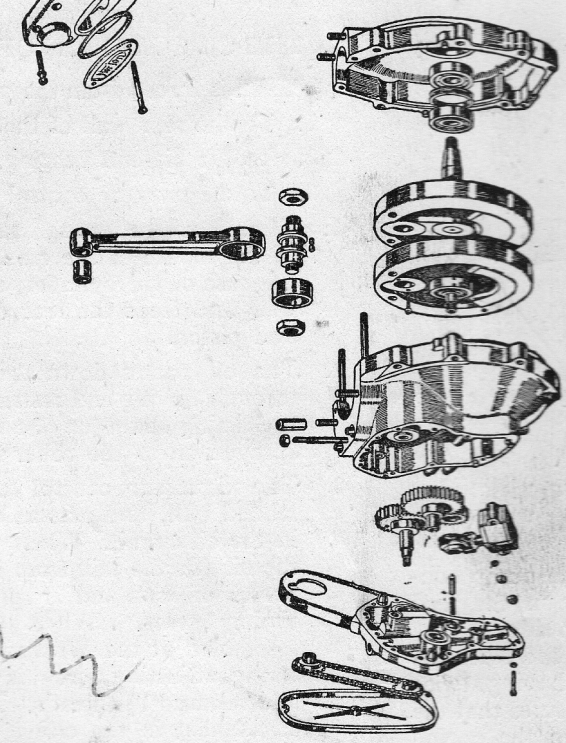
3. The oil pressure control valve is a spring-loaded ball, and acts as a safety valve, in the oil circuit. When the pressure of the oil lifts the ball from its seat, the oil passes the ball and is sprayed upon the timing gears. When the engine is assembled at the Works, the valve ball spring adjusting screw is screwed home and released  $1\frac{1}{2}$  threads. This is the only adjustment in the oiling system and it is not advisable to remove the ball from the valve unless it is suspected that the ball is sticking or not seating.

From the cylinder the oil drains down the sides of the crankcase and is picked up by ducts and carried to the main bearings and the timing gear bearings.

The oil collects in the timing case to such a level that the oil pump pinion is immersed, carrying oil to the half-time pinion and the timing gears.



O.H.V.



Side Valve.

THE ENGINE.

Fig. 3.



Oil mist is sprayed by crankcase compression, through the valve lubricator on to the valve stems, of side valve engines and is carried up the push rod cover tubes to lubricate the rockers and valves on O.H.V. engines.

Oil is fed to the magdyno chain by passing through the inlet cam spindle bush into the chain case. Any excess of oil accumulated in the case, drains through the breather pipe.

Crankcase pressure is also released by a valve on the driving side of the crankcase and oil mist is fed to the rear chain.

All the oil drains to the base of the crankcase to the sludge-trap, is picked up by the suction of the return side of the pump and returned to the tank.

The oil-way from the sludge-trap is situated so that any foreign matter is left in the trap. This leaves the case when the crankcase drain plug is removed and the oil drained.

## MAINTENANCE OF ENGINE.

### DECARBONISING.

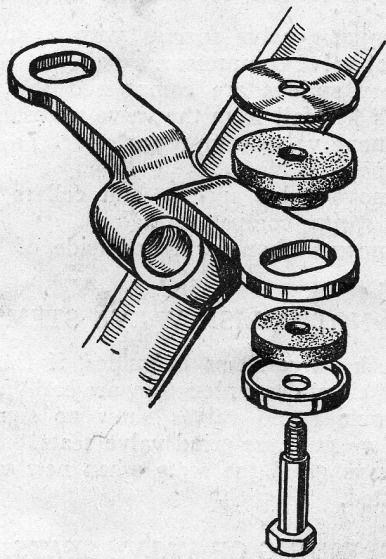
#### 6. REMOVAL OF PETROL TANK.

It is not necessary to drain tank, but make sure that the petrol tap levers are in the "Off" position, that is, with the round end of the lever pressed in.

Disconnect petrol pipes from taps. Use two spanners, holding the union nut with one, and the tap union with the other.

Remove the four bolts and washers, and the tank is free from the frame.

Four shouldered rubber washers and steel washers should be on the tank brackets.



The order in which the washers for the tank mounting should be placed. (Fig. 4.)

#### 7. FITTING OF TANK.

Place the four shouldered rubber washers

on the frame tank brackets, with the steel washers above.

Place tank in position and fit cupped steel and rubber washers on to the tank bolts. (Fig. 4)

Fit bolts to tank and tighten down evenly.

Ensure that the tank is clear of the frame.

Fit petrol pipes, using the two spanners as when removing.

#### 8. REMOVAL OF CYLINDER HEAD. 16H and BIG 4.

The cylinder head is held to the barrel by nine studs and nuts.

Remove sparking plug lead, spark-plug, and holding down stud nuts.

Remove cylinder head and joint washer.

#### 9. FITTING OF CYLINDER HEAD. 16H and BIG 4.

Examine joint washer. If damaged or shows any signs of blowing, replace.

Fit washer with the bright side to the barrel.

Fit cylinder head, cylinder head stud nuts, and tighten down evenly.

Fit sparking plug and lead.

#### 10. REMOVAL OF CARBON.

Scrape carbon from top of piston and cylinder head.

Piston is of the alloy type and care must be taken not to damage the top.

Place an old piston ring at the top of the bore, and resting on top of piston. It will prevent the carbon being removed at the edge of the piston and end of the bore.

After an engine has been used for any considerable time, wear in the bore and the

rings takes place, allowing a small amount of oil to pass.

The carbon on the piston edge and the top of the bore acts as an oil seal and if removed, engine may use a little more oil till carbon is re-formed.

The carbon deposit in the valve ports and valve spring compartment cannot be removed unless the valves are removed.

Valves need NOT be removed at every de-carbonization.

#### **11. REMOVAL OF CYLINDER BARREL. 16H and BIG 4.**

Remove petrol tank (see Para 6).

Cylinder barrel can be removed with or without the cylinder head in position.

Remove sparking plug and lead.

Remove carburetter, which is fitted to the induction stud by split ring and bolt.

Ease bolt and remove carburetter complete with pipes from the induction stub, when carburetter will hang on the control cables.

Remove valve cover and rotate engine till both valves are closed and piston at bottom of stroke.

Remove exhaust valve lifter control from arm by raising the arm and detaching inner cable.

This releases the return spring.

Screw out cable adjuster from cylinder barrel, and the cable is now free.

Remove exhaust lifter spindle from cylinder barrel. This is retained in position by a set pin in the base of the cylinder.

Remove set pin, and spindle complete can be removed with oil retaining washer and spring.

Remove the five base stud nuts. (Note: one in valve chamber.)

Cylinder is now free and can be lifted from crankcase.

A paper washer is fitted between the barrel and the crankcase.

The crankcase breather stud feeding the oil to the valve stems need not be removed.

With the cylinder removed, the piston is exposed and the cylinder can be dismantled on the bench.

It is essential to cover the mouth of the crankcase with a large piece of clean rag, to prevent the ingress of any foreign matter.

#### **12. REMOVAL OF ROCKER BOX, CYLINDER HEAD AND CYLINDER BARREL. OHV MODELS.**

Remove Carburetter, which is attached to induction stub by split ring and bolt.

Remove exhaust pipe or complete exhaust system in one piece.

Revolve engine till both valves are seated.

Remove sparking plug and rocker adjustment inspection cover.

Remove rocker box cover, rocker box attachment bolts and nuts, rocker box and distance pieces.

Remove push rods and cover tubes keeping inlet and exhaust separately.

Remove cylinder head nuts.

Rocker box may be left suspended from exhaust valve lifter cable, or completely removed.

Remove cylinder head and rotate engine till piston is at bottom of stroke.

Remove cylinder barrel (this need not be done at every decarbonisation as top of piston can be cleaned as S.V. models (see paragraph 10).

Cover crankcase mouth with rag to prevent accidental ingress of dirt or foreign matter.

#### **13. REMOVAL OF VALVES FROM CYLINDER OR HEAD.**

Compress valve springs with a suitable type of valve compressor.

When springs are compressed the valve cotters will fall from the valve stems.

Remove valve compressor.

Remove valves.

Remove valve springs and collars from valve spring compartment.

Remove carbon from underside of valve heads.

#### **DO NOT POLISH VALVE STEMS.**

Check valve stems in guides; if free, do not touch guides, unless they are badly worn.

If guides and valves show no signs of excessive wear, re-grind valve seats.

Always grind the seats when new valves are fitted.

#### **14. GRINDING OF VALVE SEATS.**

Use as little grinding compound as possible.

Place valve in guide and grind lightly, using a screwdriver or hand vice.

Do not revolve valve a complete turn, but

oscillate, frequently raising valve from seat and placing in a different position.

Do not over-grind valve seats (a wide seat is not necessary).

When seat is ground sufficiently, that is, when the marks of the grinding make a complete ring on the seat and on the valve, remove all signs of grinding paste from seat, valve and valve pockets.

If the valves or the seats are badly burnt or pitted, it may be impossible to obtain a perfect seat by grinding. The seats will then have to be re-cut, and the valves re-faced.

#### 15. FITTING OF VALVES.

Thoroughly clean valves, seats, and valve pockets. Fit valve springs and collars. Lubricate valve stems.

Fit valves into guides, compress valve springs, and fit cotters.

If the valve cotters are greased with a thick grease, the grease will hold the cotters in place until the springs are released.

#### 16. REMOVING AND RE-FITTING OF VALVE GUIDES.

Valve guides are a driving fit in the cylinder barrel or head.

To remove, tap out with a double diameter drift.

Use the drift to replace or fit new ones.

Seats must be trued-up with cutter after refitting of guides, to ensure that the guides and seats are in alignment.

#### 17. FITTING OF CYLINDER BARREL. S.V. ENGINES.

Place piston rings with ring gaps equally spaced apart.

Lubricate rings, cylinder barrel and piston. Rotate engine until the big-end bearing is near the top of its travel, with the connecting rod and piston pointing towards the front engine tube.

Fit paper washer to crankcase mouth, ensuring that cylinder feed oil hole is unobstructed.

Fit barrel over piston, keeping the barrel square with the piston.

It may be necessary to obtain assistance to enter rings into barrel.

Tighten base stud nuts down evenly.

Fit exhaust lifter spindle to cylinder with spring and felt washer, placing the milled end under the collar on the exhaust tappet, so that when spindle is rotated, the tappet is lifted.

Fit set pin to retain spindle in position.

Fit exhaust lifter cable adjuster to cylinder, together with exhaust lifter cable return spring.

Fit exhaust lifter cable to arm.

Adjust tappets (para. 20-21).

#### 18. FITTING OF CYLINDER BARREL. CYLINDER HEADS AND ROCKER BOX. O.H.V. MODELS.

Place piston rings with ring gaps equally spaced apart.

Lubricate rings, cylinder barrel and piston.

Rotate engine till piston is near top of a stroke.

Fit paper washer to crankcase mouth ensuring that cylinder feed oil hole is unobstructed.

Fit barrel over piston; it may be necessary to obtain assistance to enter rings into barrel.

Slide barrel down fixing studs and press home.

Clean cylinder head joint faces and replace joint washer (where fitted). Where no washer is fitted, smear joint faces with oil.

Fit cylinder head, cylinder head nuts, and tighten down evenly.

Place rocker box distance pieces in position and fit paper washers to distance pieces.

Fit rocker box.

Fit rocker box bolts and nuts and tighten down evenly.

Fit push rods and push rod cover tubes in same position as before dismantling.

Fit rubber seal to rocker box.

Fit rocker box cover ensuring that rubber seal is properly bedded and no rubber is trapped between the joint faces.

Adjust push rods (see para. 20-21).

#### 19. DISMANTLING OF ROCKER BOX. O.H.V. ENGINES.

Whilst rocker box is removed, check rocker assembly for end float and wear on spindles and bushes.

To remove rocker spindle, remove valve rocker arm nut and washer, lightly tap rocker arm to release from taper on shaft. Withdraw shaft and push rod arm from box.

Remove push rod arm.

Our Service Department can supply shims for adjusting end float in rocker-shaft assembly. There should be no perceptible end movement.

To remove rocker bush. Figure 5 shows quite clearly the method of removal. New bushes should be pressed in or tapped with hammer and wooden block.

Drill oil holes after fitting bush.

To remove exhaust valve lifter, remove cable from lifter arm. Remove securing pin in top of rocker box and withdraw the lifter complete with arm.

The rocker ball ends and valve rocker pads are pressed into the rocker arms and may be knocked out for replacement.

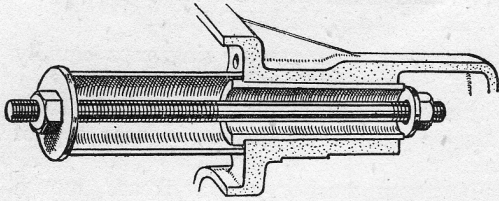


Fig. 5.

## 20. TAPPET OR PUSH ROD ADJUSTMENT ON MACHINES WHERE ENGINE NO. IS FOLLOWED BY THE LETTER Q.

Engines having a number followed by the above suffix are fitted with a modified cam form which requires rather more careful positioning of the cam than previously.

For both O.H.V. and S.V. engines proceed as follows:—

To adjust inlet valve clearance, rotate the engine until the exhaust valve is fully open and proceed to adjust the inlet tappet or push rod (para. 21). There should be .010" clearance between the valve and tappet head on S.V. engines.

On O.H.V. engines the push rod should be just free to rotate without any up and down movement.

To adjust the exhaust valve clearance, the inlet valve must be in the fully open position.

Adjust until there is .010" clearance between the valve and tappet head of S.V. engines or until the push rod is just free to rotate without end play on O.H.V. engines.

These clearances must be obtained with the engine cold.

## 21. TO ADJUST TAPPETS OR PUSH RODS.

Release the middle hexagon—locking the nut—by placing one spanner on the bottom hexagon—the tappet stem or push rod—and the second on the locking nut. (Fig. 6-7.)

Turn the top hexagon—the tappet head or push rod adjuster—in the desired direction, and when the correct clearance is obtained, tighten locking nut.

Check clearance after tightening locking nut.

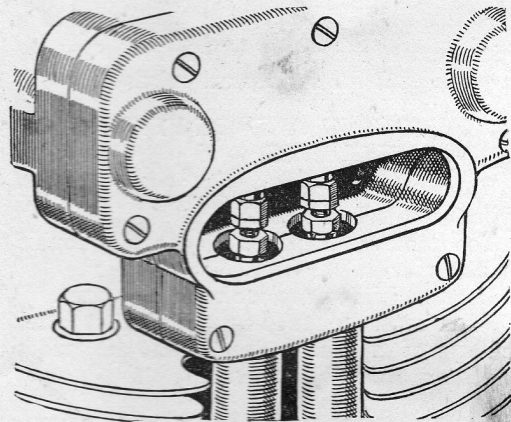


Fig. 7.

O.H.V. PUSH ROD ADJUSTMENT.

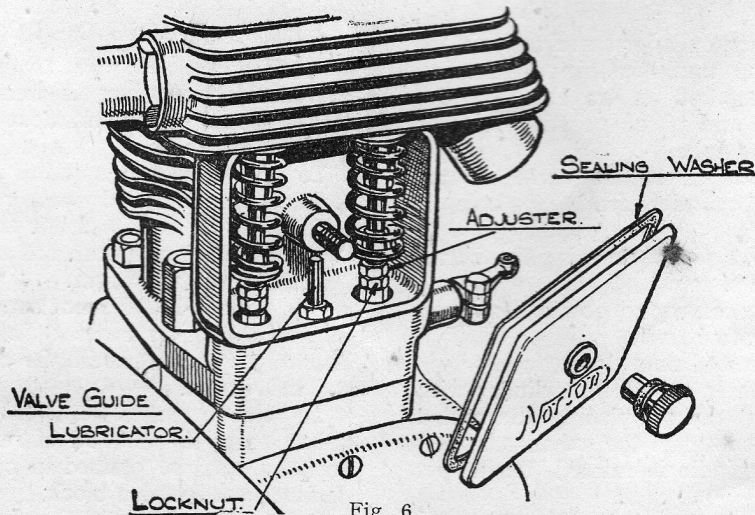


Fig. 6.

S.V. TAPPET ADJUSTMENT.

## 22. REMOVAL OF PISTON AND RINGS.

Remove cylinder barrel. (Para. 11-12.)

Remove one circlip and the gudgeon pin. Gudgeon pin is a running fit in the piston and small end bush.

Mark piston to ensure it is fitted the same way when replacing.

Remove rings from piston.

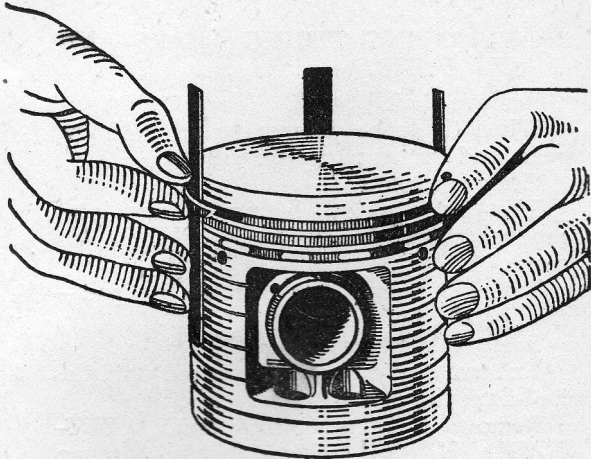


Fig. 8.

Place three thin metal strips approximately  $\frac{1}{2}$ " wide  $\times$  2" long, behind the rings equally spaced and the rings may be readily removed. (Fig. 8.)

If it is decided not to fit new rings, it is not advisable to remove the carbon from the back of the ring or the bottom of the ring groove.

If it is decided to fit new rings, the grooves in the piston should be thoroughly cleaned. A portion of a broken hack-saw blade is an ideal tool for the job.

When the grooves have been cleaned, check the new ring for size in the grooves.

There should be a side clearance of .002".

Check rings in the cylinder bore for the correct width of gap.

Place ring in bore, push ring down bore, using the piston as a guide.

The ring gap should be:

Compression ring .... .015"—.020".

Scraper .... .008".

Check gap with feeler gauge.

## 23. REFITTING PISTON.

Fit rings to piston.

Fit piston to connecting rod with the piston in the same position as before dismantling.

Fit circlip. It is advisable to always replace circlip and fit a new one.

Fit cylinder barrel. (Para. 17-18.)

## 24. REMOVING AND FITTING OF SMALL END BUSH.

If when the cylinder barrel and piston are removed it is found that the small end bush is worn it should be renewed.

Bush must be withdrawn from connecting rod.

Obtain a bolt at least twice the length of the bush, place a washer at the head of the bolt with an outside diameter less than the bush. Place bolt in bush.

Over the screwed end of the bolt place a piece of tubing longer than the bush, with an inside diameter slightly larger than the outside of the bush.

Fit nut to bolt and tighten. As nut is tightened, the bush will be drawn from the rod.

Care must be taken so that no strain is taken by the rod.

Fit new bush in the same manner.

Before fitting bush to rod, the inside diameter should be reamed to the size of the pin, as when fitted in the rod the bush will compress, leaving sufficient metal for true-ing with the reamer. If this is not done, too much metal will need to be taken away with the reamer.

Drill oil-holes in the bush before reaming to size.

The gudgeon pin should be a running fit in the small-end and the piston.

## 25. REMOVING OF TIMING PANEL.

Remove magdyno chain cover held by three cheese headed screws.

Remove sprockets with chain in position. If difficulty is experienced in removal of sprockets it will be necessary to obtain a suitable withdrawal tool.

The cam wheel sprocket is held by a taper and key. The magdyno shaft is not keyed.

Remove timing panel screws—seven cheese headed and two counter-sunk. The counter-sunk screws are in the chain case.

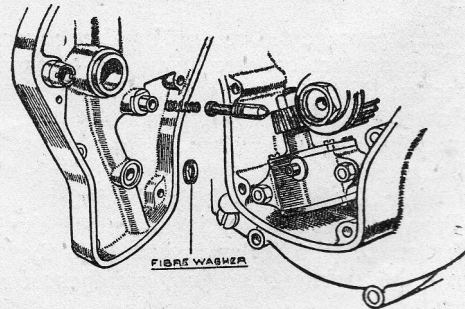


Fig. 9.

Partly remove panel, and the timing gears and rockers are visible.

See that the rockers or the inlet cam wheel do not come away with the panel. They can be held in position by a screw-driver.

When the panel is removed the big-end restriction jet will leave its holder through the pressure of the spring behind it.

Remove spring from holder. (Fig. 9.)

#### 26. FITTING TIMING PANEL.

Clean the edges of the timing chest and the panel.

Smear the edges with gold-size or jointing compound.

Check fibre washer on the oil pump nipple, connecting pump to panel.

Place panel in position and the washer should prevent the edges of the panel meeting the case by  $1/32$ ". This ensures that when the panel pins are tightened, the washer is compressed, making an oil-tight joint.

Fit spring and jet in jet holder.

Fit panel and panel screws and tighten down evenly.

#### 27. IGNITION TIMING.

Place chain and sprocket in position and tighten cam wheel sprocket nut only.

Place gearbox change-speed lever in top gear position.

Advance ignition fully.

Rotate engine by turning the rear wheel, until both valves are closed and the piston is at the top of its stroke.

The position of the piston can be ascertained by placing a thin rule into the cylinder, via the compression or sparking plug hole.

Hold rule on the top of the piston and take the reading of the rule as it leaves the cylinder.

Turn the rear wheel backwards still holding the rule on top of the piston till the rule shows the correct figure. (See data sheet.)

Remove magdyno contact breaker cover.

Turn contact breaker in an anti-clockwise direction till the points open.

Insert thin feeler gauge or thin piece of paper, between the points.

Turn the contact breaker in clock-wise direction till the points hold the feeler.

Turn contact breaker in an anti-clockwise direction till the feeler is just free, that is when the points have just commenced to open.

Place a tube over the end of the shaft and

sharply tap tube, forcing sprocket on to the taper of the shaft.

Tighten down nut carefully, so as not to turn the shaft.

When nut is tightened down, check timing.

Fit contact breaker cover.

Fit magdyno chain cover.

Fit compression plug or sparking plug.

#### 28. REMOVING TIMING GEARS AND OIL PUMP.

Remove timing panel. (Para 25.)

When the panel is removed, the timing gears and the oil pump are visible.

Remove rockers.

These are identical, but it is advisable to replace them in the same position as removed.

Examine rockers for wear on the pad—the portion that rides on the cam.

Remove inlet cam wheel.

Exhaust cam cannot be removed until the half-time pinion nut is removed.

Remove half-time pinion nut. LEFT-HAND THREAD. This is also the oil pump driving worm.

Remove the exhaust cam wheel.

Oil pump must be removed before the half-time pinion.

Remove the two nuts holding the pump and remove pump from studs.

Withdraw pinion from timing shaft..

#### 29. FITTING TIMING GEARS AND OIL PUMP.

If new timing gears are being fitted, the cam wheels should be checked for side-float.

Remove the plug covering the end of the exhaust cam spindle.

This is pressed into the panel.

Fit inlet and exhaust cam wheels in position and fit panel.

Fit and tighten all the panel pins.

The inlet cam spindle protrudes through the panel into the magdyno chain case. By pulling and pushing the spindle the side float can be felt.

In the case of the exhaust, lightly force a tapered piece of steel (the tag end of a file or screwdriver) into the hollow cam spindle, tight enough to allow the wheel to be pulled and pushed and the float felt.

The correct float is  $.004$ ".

If the float is excessive, fit pen steel washers on the spindles each side of the wheels, to take up the float.

When the correct float is obtained, remove the panel and press in the plug.

Fit rockers in position and with a feeler gauge check the clearance between the face of the cam wheels and the back of the rockers. This should be .006".

Remove rockers and timing gears.

Fit half-time pinion.

It will be noticed that three key-ways are machined in the pinion.

Rotate engine until the piston is at the top of the stroke.

The key in the timing shaft is now at the bottom of the shaft.

Use the key-way in the pinion that will allow the timing mark on the pinion to be in the 2 o'clock position.

Fit exhaust cam wheel, meshing teeth as marked.

Fit inlet cam wheel, meshing teeth as marked.

Fit rockers and check timing. (See data sheet.)

If the timing gears have for some reason been changed and the replacements are not marked, some difficulty may arise when re-timing. It can be simplified by adopting this method.

With piston on top dead centre, mesh the exhaust cam with the pinion in such a position that the valve is about to close, and the inlet in such a position that the valve is about to open.

Check timing (see data page) and if not correct, by moving gears one tooth either way, the correct timing should be obtained. If this is not possible, remove pinion and refit, using the next key-way, until the correct timing is obtained.

By changing the pinion from one key-way to another, the difference of one-third of a tooth is obtained.

Fit oil pump pinion retaining nut. **LEFT HAND THREAD.**

Fit oil pump.

Thoroughly clean back of pump and the face of the case on which the pump rests. If any jointing compound is used, use it very sparingly, and see that no compound is allowed to obstruct the oil holes in the pump or the crankcase.

Check the fibre washer on the oil nipple, connecting pump feed to panel.

Fit panel. (Para. 26.)

Time magdyno. (Para. 27.)

### 30. OIL PUMP.

The oil pump is of the gear type. It is not advisable to dismantle it.

When pump is removed from timing chest, test for play in the spindle by pulling and pushing the worm wheel.

Revolve spindle and place fingers on the oil holes and the action of the gears should be felt if the pump is in good condition.

When revolving pump, any foreign matter obstructing the gears will be felt. Wash out with paraffin.

### 31. OIL CONTROL VALVE.

This is fitted in a boss on the inside of the timing panel. It is an assembly of a ball, spring and adjusting screw. The adjustment is set at the works and should not need any attention.

The control valve acts a safety valve in the oil circuit. When the oil is cold, the oil pressure in the circuit tends to become excessively high, but the excess of pressure lifts the ball from its seat, allowing the oil to spray on to the timing gears.

If for any reason this is dismantled, the order of assembly is—ball, spring and adjuster nut.

Tighten the nut home and then screw out one and a half turns and lock with centre punch.

### 32. REMOVAL AND FITTING OF MAGDYNO.

The removal of the magdyno is simplified if the timing panel is removed.

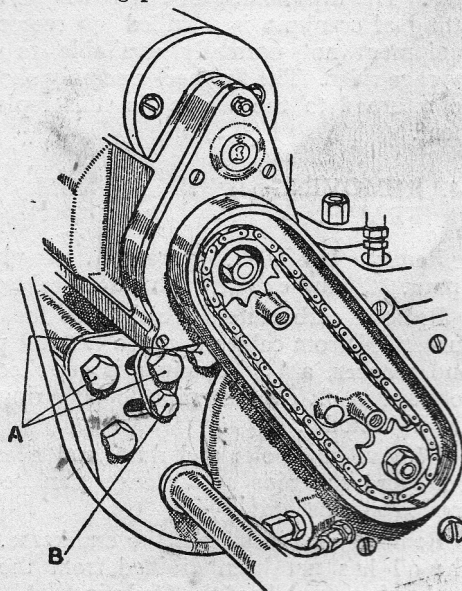


Fig. 10.

















































































