

Maintenance Manual and Instruction Book

FOR

THE UNAPPROACHABLE

Norton

REGD. TRADE MARK

MOTOR CYCLE

Models International 30 & 40

up to 1953

Manx 30 & 40

up to 1951

Publication P86

NORTON MOTORS LIMITED

BRACEBRIDGE STREET, BIRMINGHAM, 6

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Price 3s. 6d.

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DATA

Model	30 Standard	40 Standard	30 M.	40 M.
Cubic Capacity	490 c.c.	348 c.c.	499 c.c.	348 c.c.
Bore	79 mm.	71 mm.	79.62 mm.	71 mm.
Stroke	100 mm.	88 mm.	100 mm.	88 mm.
Compression Ratio	7.12	7.33	See para. 40	
Sparkign Plug	K.L.G. F70	K.L.G. F70	K.L.G. 689	K.L.G. 689
Ignition Timing				
Before top, fully advanced	42½°	42½°	42½°	42½°
Magneto Points, gap ...	.012"	.012"	.012"	.012"
Plug Points, gap ...	.020"	.020"	.020"	.020"
Valve Timing				
	To be set with .004" clearance in both valves			
Inlet Opens before top ...	47½°	47½°	57½°	57½°
Inlet Closes after bottom..	70°	70°	60°	60°
Exhaust Opens before bottom	85°	85°	85°	85°
Exhaust Closes after top...	42½°	42½°	42½°	42½°
Tappet Clearance—cold				
Inlet ... ..	.010	.010	.010	.010
Exhaust ... ..	.020	.020	.020	.020
Amal Carburetter				
Type	T.T.	T.T.	Remote	Needle
Choke	1-5/32"	1-3/32"	1-3/16"	1-3/32"
Main Jet	310	260	See paras.	89-90.
Needle Jet	109	107		
Throttle Slide	5	4		
Engine Sprocket, Solo ...	20	18	20	18
Engine Sprocket, Sidecar	18	Not recommended	18	Not recommended
Gear Ratios, Solo ...	4.64, 5.1	5.16, 5.67	4.64, 5.1	5.16, 5.67
	6.18, 10.8	6.85, 10.02	6.18, 8.22	6.85, 9.12
	5.16, 5.67	Not recommended	5.16, 5.67	
Gear Ratios, Sidecar ...	6.85, 12.02		6.85, 9.12	
Petrol Tank Capacity ...	3¼ gallons	approx.	4½ gallons	3¼ gallons
Oil Tank Capacity ...	½ Pint approximately			
Gearbox Capacity ...				Not fitted
Chaincase Capacity ...				
Tyre Pressures	Front 24		Rear 24	

INTRODUCTION

In preparing these instructions all elementary details and preliminary information has been omitted on the assumption that all owners of an International Norton are already acquainted with the operations of starting, driving and maintenance and with the layout and function of the various controls.

Although all International engines are run in and have to pull a certain minimum load before being passed off the test-bench, it must be remembered that the gearbox and cycle parts have not undergone this running in process. For this reason it is wise to use the available speed and acceleration with discretion during the first few hundred miles, although it is not necessary to adhere to a set running in schedule.

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's Castrol "R" is used exclusively for the International models and is strongly recommended, particularly when the machine is used for racing. Other very suitable oils for the overhead cam shaft engines are:—

SHELL X-100-40 or B.P. ENERGOL S.A.E. 40 for Summer use.

SHELL X-100-30 or B.P. ENERGOL S.A.E. 30 for Winter use.

MOBILOIL "BB" for Summer use.

MOBILOIL "A" for Winter use.

These oils should be used in the engine and gearbox.

For oilbath chaincase use Wakefield's "Castrolite," Shell X - 100 - 20, Price's Energol S.A.E. 20, or Mobiloil Arctic.

All bearings not automatically lubricated are fitted with nipples for grease gun lubrication, and a good quality grease, such as Wakefield Castrolase Heavy, B.P. Energrease C3, Shell Retinax or Mobiloil Hub Grease 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 the chart is adhered to, excessive wear will not occur at 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; the gearbox is most readily filled by means of an oil gun. If oil is poured in allow plenty of time and operate the kickstarter occasionally; beware of air locks. Remove level indicator plug from oil bath chain case and fill to this level.

On machines to full racing specification where the front and rear chains are lubricated by adjustable drip feeds, these should be set to deliver approximately six drops per minute when the oil has reached its normal working temperature.

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	Spring Frame Fork Ends	Grease		Brake shoe cams (sparingly) ...	Grease
	Control cables ...	Oil		Brake rod jaw joints ...	Oil
	Control levers ...	Oil		Speedometer driving box	Grease
	Brake cable "U" clip ...	Oil		Drain and refill oil tank	Oil
	Gearbox control rod pins	Oil		Steering head races ...	Grease
	Wheel bearings ...	Grease	Every 5,000 miles	Saddle front pivot ...	Oil
	Rear chain ...	Grease		Gearbox, drain and refill	Oil
	Gearbox, top up ...	Oil		Commutator end bracket	Oil
	Oil Bath, top up ...	Oil		Telescopic Forks	See para 70
Every 2,000 miles	Footchange lever ...	Grease	Every 10,000 miles	Oilbath, drain and refill	Oil

THE ENGINE

1. LUBRICATION SYSTEM.

This is of the dry sump type, the oil is drawn from the oil tank by the pump and fed to various parts of the engine. It drains back to the crankcase bevel chamber and the sump and is returned to the tank by the pump.

2. THE FILTER.

The main filter in the lubrication system is of the gauze type and is screwed into the base of the oil tank. It has the oil feed pipe attached to it. Clean filter when oil tank is drained.

3. OIL PUMP.

The pump contains three pairs of gears, one pair supplying the whole of the engine, the second pair returning oil from the crankcase bevel chamber, and the third pair returning oil from the sump to the tank. The returning oil is visible through the oil tank filler cap as an intermittent bubbly stream.

4. OIL LEVEL.

The oil level in the tank should not be more than three-quarters and not less than one-half full. Under conditions of sustained high speed there is a tendency for the returned oil to become aerated and frothy, and for a pressure to be created in the tank and oil may be lost through the breather pipe if the tank is over three-quarters full. Always run the engine before checking the oil level as it is possible for a small amount of oil to seep back into the crankcase if the machine has been idle for any length of time.

5. OIL CIRCULATION.

Oil passes from the sump to the tell-tale or indicator (this is not fitted to 'M' models), situated immediately to the rear of the vertical shaft bottom housing. The stem of the indicator should be raised $\frac{3}{8}$ " to $\frac{1}{2}$ " when the engine is running. From the tell-tale the oil is fed to

- (a) The big end bearing.
 - (b) The rear wall of the cylinder.
 - (c) The rocker box.
 - (d) The pressure release valve.
- (a) The oil passes across the bottom bevel chamber cover joint face to the big end

restriction jet, along the timing side main shaft through the fly-wheel and into the crankpin.

- (b) The oil is fed to the adjusting screw in the end of the hollow top rear crankcase bolt, along this bolt through the base of the cylinder and up the cylinder wall. The correct setting for the cylinder feed adjuster is $\frac{1}{2}$ to $\frac{3}{4}$ turn from the fully home position, or until a faint haze is visible from the exhaust pipe when the engine is accelerated.
- (c) The external pipe adjacent to the cylinder feed adjuster supplies the rocker box. On the standard International models the oil is metered into the rocker box by a distance piece between the cam shaft ball race and the cams. This distance piece has an external keyway which mates once every revolution with the oil feed hole, and admits a pre-determined amount of oil to the box. On the Manx type Internationals the oil is fed direct to the cam faces via a restriction jet centrally situated in the top bevel cover along the hollow cam shaft and out through the flank of the cam.
- (d) The pressure release valve situated in the crankcase behind the magneto chain cover consists of a hexagon headed adjuster with lock nut, spring and ball, and if dismantled should be set $2\frac{1}{2}$ to 3 turns back from the fully home position. Should it be found that oil drains into the crankcase when the machine is left standing suspect foreign matter on this ball or its seating.

Oil from the rocker box drains down into the bottom bevel chamber lubricating on its way the bevels, vertical shaft bearings and the valve guides (through two external pipes from the rocker box bevel chamber). From the bevel chamber it is drawn by the pump through a hollow slotted filter bolt and returned to the tank via the same pipe that returns the oil from the sump. In the bottom of the crankcase is a sludge trap in which particles of foreign matter carried in the oil are collected. The crankcase drain hole communicates with this sludge trap, which is effectively cleaned when the drain plug is removed.

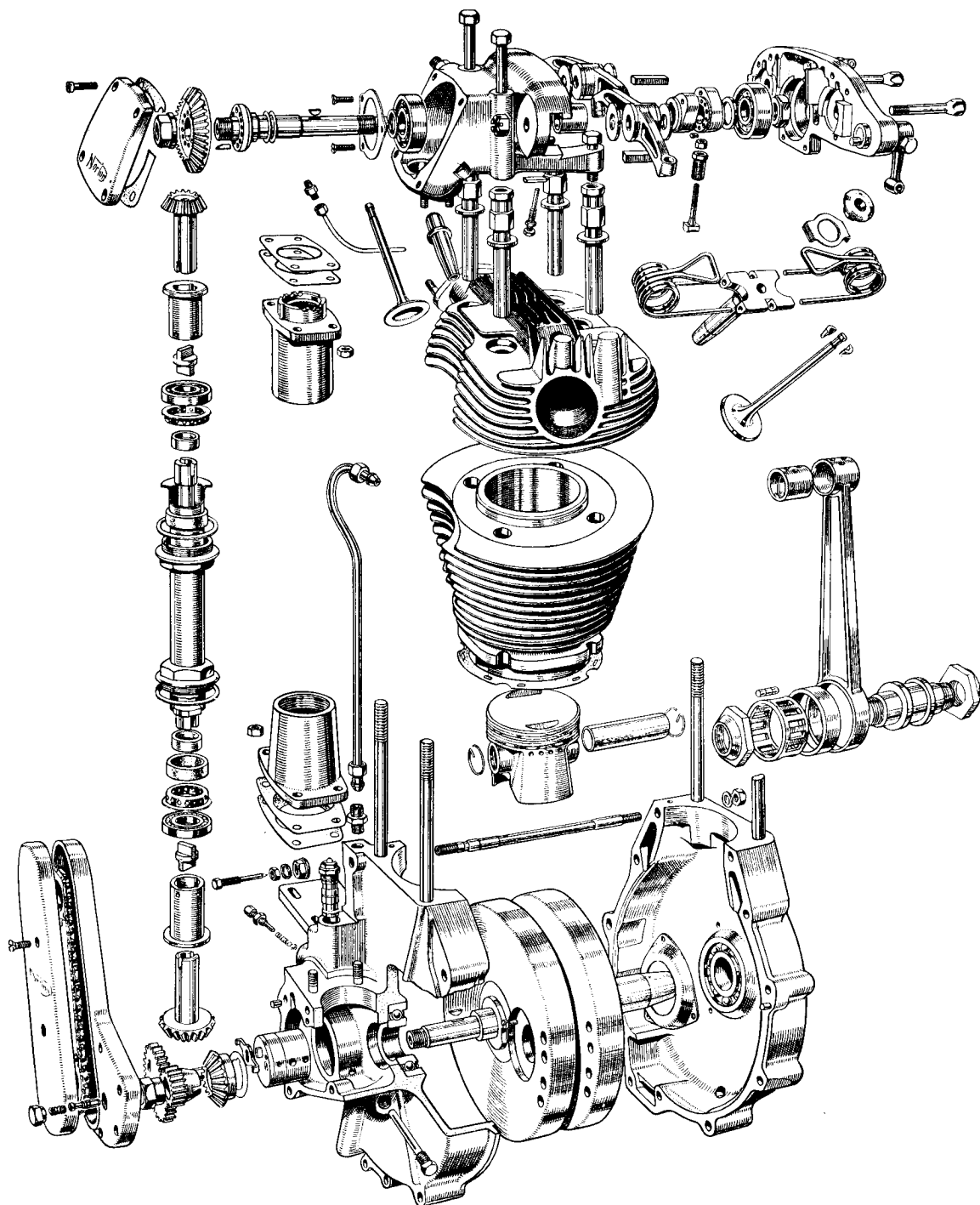


Fig. 1

MAINTENANCE OF ENGINE

6. REMOVAL OF PETROL TANK, STANDARD 30 and 40.

It is not necessary to drain the tank, but make sure that both petrol taps are in the "off" position. Disconnect petrol pipes from taps using two spanners, 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 platform.

7. REMOVAL OF PETROL TANK, "M" TYPE 30 and 40.

With both petrol taps turned "off" disconnect petrol pipes from taps, remove the two nuts from the bottom of the straight-through tank bolts and remove the steel cup and rubber washer from the underside of the tank platforms; tap each bolt upwards until it is flush with the platform when the tank may be withdrawn.

The bolts, top cups and rubbers need not be completely removed from the tank.

8. FITTING OF PETROL TANK, STANDARD 30 and 40.

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. 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.

9. FITTING OF PETROL TANK, "M" TYPE 30 and 40.

There are three lengths of tank bolts; the two longest of equal length secure the front of the tank.

Of the remaining two the shorter is fitted on the stepped side of the tank. Ensure that the cups and rubbers are correctly positioned (Fig. 2). Tighten the tank bolt nuts evenly, ensuring approximately equal pressure on all rubbers. Fit and tighten lock nuts, fit petrol pipes.

10. REMOVAL OF ROCKER BOX AND CYLINDER HEAD.

Remove tank (para. 6 or 7). Remove carburetter, exhaust pipe and sparking plug and disconnect exhaust valve lifter cable, if fitted. Remove rocker box bevel cover. On

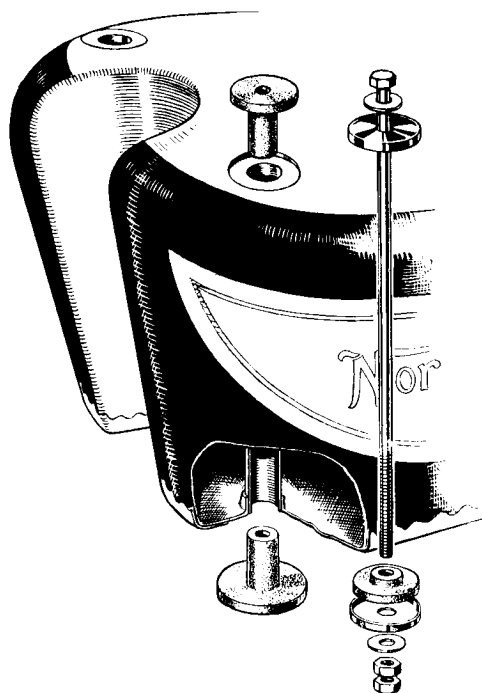


Fig. 2

racing engines ensure that oil feed jet and spring are not lost. Rotate engine till piston is on top dead centre and the marked teeth on the top bevels are mated. Remove oil feed pipe and valve guide lubricator pipes. Completely unscrew the bottom vertical shaft cover tube nut and remove rocker box holding down bolts. Rotate engine $\frac{1}{4}$ turn forward to bring vertical shaft coupling into a suitable position to allow the rocker box to be tilted away from the engine. Lift approximately $\frac{1}{2}$ " and withdraw the box sideways. Remove cylinder head nuts and cylinder head. Should the head be tight tap beneath inlet port with mallet or wooden block. A distance washer is fitted in the bottom of the cylinder head nut recesses; care should be taken that none of these are lost.

11. REMOVAL OF CARBON.

Carefully scrape carbon from piston crown and cylinder head, but for a normal decarbonization it is not desirable to remove the piston rings or clean the ring grooves. The carbon in the valve ports cannot be satisfactorily removed without removing the

valves (para. 12). On the racing models ensure that the ports and combustion chamber are as smooth as possible.

12. REMOVAL OF VALVES.

As a standard valve spring compressor is inconvenient on the hairpin valve springs it is desirable to make one from a large pair of pliers or small tongs. (Fig. 3)

It then becomes a simple matter to compress and withdraw each spring separately and to remove the valves. The valve cotters for the inlet and exhaust are not interchangeable and should not be mixed. Remove all carbon from the valve and check its fit in the guide. There will be a certain amount of rock, but this should not be excessive.

13. GRINDING AND RE-FITTING VALVES.

Use as little grinding compound as possible and grind lightly, using a hand vice. Oscillate rapidly, frequently raising valve from seat and placing in a different position. It is only necessary to grind until the marks indicate a complete seat on valve and head. A narrow seating is desirable. On light alloy heads do not use the coarser grade of grinding compound and finish off with metal polish, carefully removing any burrs raised at the edge of the valve seat. Remove all traces of grinding compound, lubricate valve stems and place in position. Place valve spring plate and top cup over valve stem. Grease cotters all over, place in position and draw the top cup home. The grease will

hold the assembly in position whilst the valve springs are being fitted.

14. VALVE GUIDES, REMOVAL AND FITTING.

The bottom valve spring collar on the exhaust side is integral with the valve guide. The inlet is separate and is located by a peg in the cylinder head. Both guides are a driving fit in the cylinder head and should be tapped out of position by a double diameter drift, which should also be used when fitting replacements.

Ensure that oil feed hole in guide lines up with hole in cylinder head. After fitting valves and spring check that the spring tension is correct. There should be a gap of $\frac{1}{2}$ " to $\frac{9}{16}$ " between the upper side of the valve spring collar and under side of spring (Fig. 3). On machines used for racing the valve spring should be renewed at fairly frequent intervals and when removed should be offered up against each other to ensure that none of them have taken a permanent set.

15. CYLINDER HEAD AND ROCKER BOX FITTING.

Thoroughly clean cylinder barrel and cylinder head joint faces. Fit cylinder head and sleeve nuts, pinching up each one before finally tightening. If engine or vertical shaft have not been rotated whilst the rocker box has been out of position the box, complete with vertical shaft, etc., may be refitted. If either have been moved re-set as follows:

Rotate engine in normal direction till

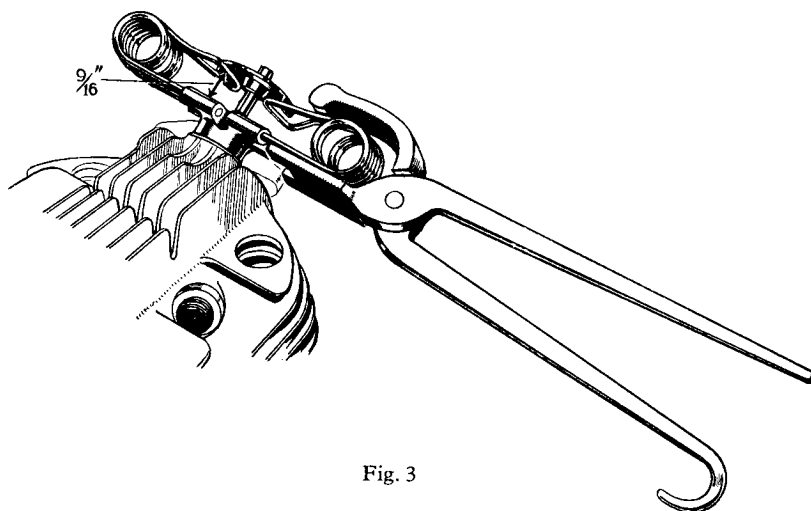


Fig. 3

piston is on top dead centre following the opening of the contact breaker points, and continue rotating till the vertical shaft coupling in the bottom housing is at right angles to the machine, rotate vertical shaft till the marked teeth on the rocker box bevels are mating and continue to rotate in the normal working direction till the slot in the bottom end of the vertical shaft lies in alignment with the bottom coupling. Place vertical shaft, cover tube and rocker box in position, ensure that rocker box is properly seated on the cylinder head nuts, fit rocker box bolts and tighten evenly, replace vertical shaft cover tube bottom nut and all other fittings. Check valve clearance, adjust as necessary.

16. ROCKER BOX, DISMANTLING.

Remove vertical shaft, cover tube, top bevel housing and rocker box cover. Slacken the oil retaining pad screws beneath rocker box, remove rockers. Although these are identical they must not be interchanged; remove nut from squared end of cam shaft and withdraw roller bearing and any spacing washers from shaft. Before disturbing the cams mark a line across both neutrals, this will enable them to be correctly re-assembled. The cams are located together by means of a roller fitting into holes in the butting faces of the cams. Remove inlet cam and note the holes into which the roller (which may remain in either cam) fits. To remove exhaust cam, which is keyed to shaft, it may be necessary to bend a strong strip of metal at right angles in opposite directions, leaving about 6" between the bends and shortening one of the bent ends sufficiently to insert it behind the lobe of the cam. Tapping the other bend with a hammer should withdraw the cam. Do not remove bevel wheel from cam shaft, but tap complete assembly out of box. The shims between the bearing and the collar on the cam shaft provide correct meshing of the bevels and should not be altered. Remove distance piece from behind cam shaft ball race, unscrew the three screws securing the bearing retaining washer and press out the bearing; unless the box has been leaking oil do not disturb the oil seal packings.

17. ROCKER BOX, OIL SEALS.

The re-packing of the rocker box for oil tightness is an operation on which an owner may spend much time and patience with but indifferent results. We strongly recommend

that rocker boxes requiring re-packing should be sent complete to our Service Department; the approximate cost of this work is £1, but this price does not include any replacements which may be found necessary when the box is dismantled.

18. ROCKERS, DISMANTLING AND RE-ASSEMBLY.

The rocker end pads are pressed into the rocker and may be drifted out for replacement. The end cups may also be removed from the rocker bearing and the whole assembly, consisting of bush, cage, rollers and retaining washers, drifted or pressed out of the rocker.

Press or drift end pads into rocker ends, press rocker bush into position, followed by one retaining washer. Assemble rollers in cage, lubricate and place in bush. Press remaining retaining washer into position and ensure that neither washer stands proud of the rocker boss; press on end caps.

19. ROCKER BOX, ASSEMBLING.

Ensure that all oil holes are free from any obstruction. Press cam shaft bearing into position, fit retaining plate and lock retaining plate screws with solder. On Standard engines check that the cam shaft distance piece is a reasonable fit in the hole behind the bearing as this distance piece controls the amount of oil entering the rocker box. Press cam shaft into bearing ensuring that original shims are between bearing and collar on cam shaft. Fit exhaust cam, i.e., the cam with the keyway. Fit inlet cam so that the lines previously scribed across the neutrals of the cams correspond. If the marking has been wiped off or the position of the locating peg lost, or if new cams are being fitted, it will be necessary to re-locate the cams. The locating peg will have remained in one of the numbered holes shown

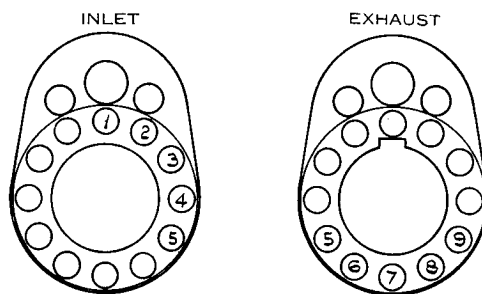


Fig. 4

in fig. 4. Say No. 5 in the exhaust cam, in which case the hole in the inlet cam to give correct timing will be No. 1. Possible alternative combinations will be:—

Exhaust Cam.			Inlet Cam.		
Peg in No. 5 hole.			Peg in No. 1 hole.		
" " 6 "	"	" 2 "	" " 2 "	"	" 2 "
" " 7 "	"	" 3 "	" " 3 "	"	" 3 "
" " 8 "	"	" 4 "	" " 4 "	"	" 4 "
" " 9 "	"	" 5 "	" " 5 "	"	" 5 "

The correct timing, given on the data page, should be obtained with .004" clearance in each valve. Replace any spacing washers fitted behind the inlet cam. Re-fit roller bearing and nut and tighten. It is a **left-hand** thread. It is advisable to renew the cork washers fitted in the bottom of the rocker recesses in both box and cover, fit rockers and rocker box cover and tighten screws, fit and tighten rocker spindles, fit split cotter. Adjust rocker sealing pad screws until rockers are stiff to move by hand.

20. BEVEL HOUSING, DISMANTLING AND RE-ASSEMBLING.

The procedure for top or bottom housing is the same. If still in position remove gland nut and washer, vertical shaft cover tube, rubber ring and cupped steel washer. Detach bevel housing from crankcase or rocker box and remove the packing shims from the studs. The bevel is held in the bush by the collar pressed over its shank. Very little wear takes place in the bevel bush and it is very rarely necessary to remove the bevel completely. The collar may be removed from the bevel by drifting or pressing the bevel out of the bush. To remove the ball race, gently warm the housing and tap the threaded end on a wooden block when the ball race should drop out. Note that there is a thin dished washer fitted beneath the ball race in the bottom housing. No difficulty should be encountered in re-assembling the housing, but the following should be borne in mind.

The thin dished washer fits beneath the ball race in the bottom housing. The deeper of the steel cups and the narrower of the rubber rings are also fitted to the bottom housing.

21. BEVEL HOUSING AND VERTICAL SHAFT RE-FITTING.

Fit top housing to rocker box meshing the marked bevel teeth and ensuring that

the packing shims originally fitted between box and housing are replaced. Fit vertical shaft, vertical shaft cover tube, rubber washer and gland nut to top housing. With piston on top dead centre after the contact breaker points have broken, fit bottom housing, meshing the bevels so that the bottom coupling lies parallel to centre line of machine, re-fitting any shims originally fitted at this joint. Rotate engine $\frac{1}{4}$ turn forwards to bring coupling at right angles to machine. Rotate vertical shaft anti-clockwise viewed from bottom until coupling slot lies in correct position for coupling to enter. Fit rocker box, etc., para. 15.

22. CYLINDER BARREL, REMOVAL.

It should not be necessary to remove cylinder every time the head is removed. To remove barrel, break the joint between crankcase and cylinder base and raise barrel sufficiently to insert a piece of clean rag in the crankcase mouth to prevent any pieces of loose carbon or broken piston ring dropping into crankcase. Rotate engine till piston is near bottom dead centre and remove cylinder barrel.

23. REMOVAL OF PISTON AND RINGS.

Remove one circlip and the gudgeon pin. Mark piston to ensure it is fitted the same way when replacing. Remove rings from piston. Unless new rings are being fitted it is not advisable to remove the carbon from the back of the ring or the bottom of the ring groove.

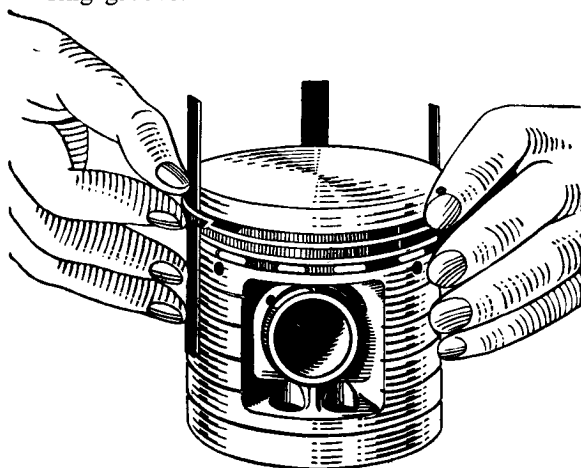


Fig. 5

When new rings are being fitted, grooves should be thoroughly cleaned. Check new

rings for side clearance in the grooves. There should be .002". Check rings in cylinder bore for width of gap. This should be .015" to .020" for the compression ring, .008" for the scraper ring. Ensure that ring is square in bore when checking these figures.

24. RE-FITTING PISTON.

Fit rings to piston, fit piston to connecting rod in the same position as before dismantling. Fit new circlip in place of the one which has been removed. Fit cylinder barrel, etc.

25. REMOVAL AND FITTING OF SMALL END BUSH.

Whilst the piston is removed from the connecting rod, the small end should be checked for wear. If play is found between the gudgeon pin and the small end bush, the bush should be renewed. To withdraw the bush 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. Insert bolt through bush and place over the end of the bolt a piece of tubing slightly longer than the bush with an inside diameter slightly larger than the outside of the bush. Fit nut to bolt and tighten. This will draw out the bush. Fit new bush in the same manner. It will afterwards be necessary to ream the bush to fit the gudgeon pin. Drill oil holes through bush before reaming to size.

26. EXAMINATION OF BIG END.

With the cylinder removed, rotate the fly-wheel till the crankpin is in the topmost position. Hold connecting rod with both hands, pull and push, and any up and down play can be felt. Do not use side pressure, and do not mistake side float for end play. A small amount of rock is of no importance, but if any appreciable up and down movement is present a new crankpin bearing is necessary. The dismantling of the fly-wheels and fitting of crankpin is a skilled job requiring equipment not normally available to the average rider. The fly-wheel assembly should be returned to the works for the replacement.

27. REMOVING ENGINE FROM FRAME.

Remove tank, para. 6 or 7. Remove carburetter, which may be left suspended

from cables. Remove exhaust pipe and silencer, a "C" spanner is supplied in tool kit to fit exhaust pipe locking ring. Remove clip bolts and nuts and silencer bolt, and the pipe and silencer can be removed as one unit. Remove oil pipes from crankcase. If oil has not been drained from the tank, plug the end of the feed pipe. Remove oil bath, engine sprocket and clutch, para. 41. Remove front and rear engine plates completely. Remove engine cradle bolts and lift engine clear of frame.

28. REMOVAL AND FITTING OF MAGDYNOR OR MAGNETO.

Remove magneto chain cover. Remove both sprockets with the chain in position. If difficulty is encountered obtain a suitable withdrawal tool. Remove the nuts beneath the magneto platform and the magneto or magdyno may be lifted off. Re-fit in the reverse order, leaving the sprocket on the magneto shaft loose.

29. MAGNETO TIMING.

The magneto should be in the approximate position for correct chain adjustment, fix a degree plate to the driving side main shaft and attach a fixed pointer to some suitable crankcase bolt. Set the piston on top dead centre with both valves closed, and whilst in this position, set the degree plate zero to the fixed pointer.

Rotate engine in opposite direction to normal running till the $42\frac{1}{2}^\circ$ mark is opposite the pointer. Rotate contact breaker till the points are just opening. Lock the sprocket securing nut and check that the timing is correct. Check tension of magneto chain. There should be $\frac{1}{4}$ " whip in the chain midway between the sprockets.

30. CRANKCASE BEVEL COVER—REMOVAL.

Remove mag. chain cover, chain and sprockets, para. 28. Remove bevel cover screws and withdraw bevel cover from dowels. The cover will bring with it the big end feed jet, the oil pump driving gear and probably the oil pump driving plate.

31. BOTTOM BEVEL WHEEL—REMOVAL.

Remove left-hand threaded nut from main shaft. Remove half-timing pinion. If tight, insert screwdriver between gear and bevel and lightly tap with hammer. Remove bevel.

This may be levered off. Ensure that none of the shims fitted behind the bevel are lost.

32. PARTING OF CRANKCASE HALVES.

Remove crankcase drain plug and drain off oil. Remove engine sprocket key. Remove remaining crankcase bolts and stud nuts, but before removing the top rear bolt which carries the cylinder oil feed adjusting screw, this screw should be tightened right home, noting the number of flats it is turned through and the position of the punch mark on head of screw. It should be replaced in the same position. Remove crankcase sump screw. Crankcase halves may now be separated, removing timing side first. If leverage is necessary, rotate fly-wheels till crankpin is at the mouth of the case. Place a lever against the crankpin nut and lever outwards. To remove driving side half, lightly drop the end of the main shaft on to a wooden block when the case should leave the shaft.

33. OIL PUMP—REMOVAL.

Remove the two screws securing the pump and insert in their place two $\frac{1}{4}$ " diameter rods of sufficient length to stand above the pump body a few inches so that they may be gripped and the whole pump body revolved and withdrawn. Should this fail to be effective it will be necessary to tap out these holes $\frac{3}{32}$ " diameter and obtain two $\frac{3}{32}$ " bolts long enough to screw into the pump body and still stand proud of the bevel chamber joint face. Drill two holes in a stout steel strip approximately the same centres as the pump screws, place the strip across the joint face, pass the bolts through the strip and into the pump body; screw each bolt a part of a turn and thus withdraw the pump.

34. OIL PUMP—DISMANTLING AND RE-ASSEMBLING.

Scribe a line along the pump body and cover clear of the oil holes. This will ensure that the pump body is re-assembled correctly. Remove the two screws holding cover and body together when the whole of the pump will come apart. Thoroughly wash all components and examine gears for marks of foreign matter having entered the pump. The gears cannot be wrongly assembled and are marked for mesh, but it is possible to fit

the driving shaft into the wrong hole. When correctly assembled and held in the hand with the brass cover facing and the driving shaft on the right hand side, there should be two holes visible on the upper side of the circular body and three underneath. Whilst dealing with the oil pump and the bevel chamber, remove the slotted hollow bolt screwed into the front side of the chamber and communicating with the pump housing. This should be thoroughly cleaned. Remove also the pressure release valve situated in the part of the crankcase normally hidden behind the mag. chain cover.

Before removing, slacken the lock nut and note the number of turns necessary to screw the adjuster right home. This will enable it to be re-set correctly when re-assembled. Thoroughly clean out all oil-ways.

35. MAIN SHAFT BEARINGS—REMOVAL.

Carefully melt the solder holding the retaining plate screws and wipe off as much as possible whilst fluid. Remove screws and plate, gently warm the case and drop each half face downwards on a wooden block. The bearings should then drop out.

36. MAINSHAFT BEARINGS RE-FITTING.

Gently warm the crankcase and push the bearings into position. On the "M" models the timing side bearing is a double row ball journal, having two grooves across the side of the outer race. This side of the race should fit against the retaining plate. On the Standard 30 and 40 the shielded side of the timing side bearing should be at the bottom of the housing. On the driving side the roller bearing is fitted next to the fly-wheels. On "M" models this also has the grooves already mentioned which should be fitted against the retaining plate. Note that there is a distance piece between the inner and outer races of the two bearings fitted on the driving side. Fit retaining plates and solder over the screw heads. With a blunt punch distort a little of the retaining plate into the grooves in the outer races of the "M" model bearings. This will prevent "creep" of the outer race. Lubricate bearings.

37. OIL PUMP AND PRESSURE RELEASE RE-FITTING.

If possible obtain a $\frac{1}{4}$ diameter by 26 thread stud $\frac{2}{3}$ " long and screw this into one of the pump securing screw holes at the bottom of the pump housing. Gently warm the case, pass the stud through the appropriate hole in the pump body and push the pump into position. The driving shaft should lie towards the right-hand side of the pump. Fit securing screws. Before fitting the pressure release valve, lie the ball ($\frac{7}{32}$ " diameter) in the bottom of the hole in the crankcase and give a sharp tap with a brass punch. This will ensure a good seating. Fit spring, adjusting screw and lock nut and adjust $2\frac{1}{2}$ to 3 turns back from the fully home position or to the same position as originally set.

38. ASSEMBLY OF CRANKCASE HALVES.

Fit .005" packing shim to timing side main shaft. Fit fly-wheels into case. Fit and tighten bolts. Check that connecting rod small end is central in the crankcase mouth. The side float of the connecting rod on the crankpin should be taken into account when checking. Fit any further shims necessary to centralise the connecting rod. This should be re-checked when the timing side main shaft nut is tightened up. Pour a little oil over the big end.

39. BEVEL CHAMBER— RE-ASSEMBLY.

Fit packing shims, bevel and half-time

pinion to main shafts. These fit on a common key. Fit and tighten main shaft nut, **left-hand** thread. If new bevels have been fitted it will be necessary to fit the bottom bevel housing and re-mesh the bevels. These should be free to rotate with just perceptible back-lash all round, and should be so meshed and the inside of the bevelled teeth should be approximately level. Place oil pump driving plate on end of pump shaft in vertical position, fit half-speed gear and big end oil feed jet and spring to bevel chamber cover. Fit paper washer and check that oil hole in joint face is clear. Fit and tighten cover, check end float in half-speed gear shaft and shim up as necessary. Complete re-assembly as previous paragraphs.

40. COMPRESSION RATIOS— "M" MODELS.

Unless ordered for use with alcohol fuel or to any specified ratio the 30 "M" is delivered with a ratio of 7.22 to 1. The 40 "M" has a ratio of 7.33 to 1. When alcohol base fuel is to be used these ratios should be raised to 13 to 1 and 14 to 1 respectively by the fitting of a high compression piston and the removal of the compression plates from beneath the cylinder barrel. For use with a 50/50 petrol benzol mixture it is only necessary to remove the compression plates. When an alteration of this nature has been made it is desirable to check that there is a clearance of at least .050" between the piston crown and the valve heads when the piston is on top dead centre and the valves on the overlap period.

THE TRANSMISSION

41. REMOVAL OF OIL BATH.

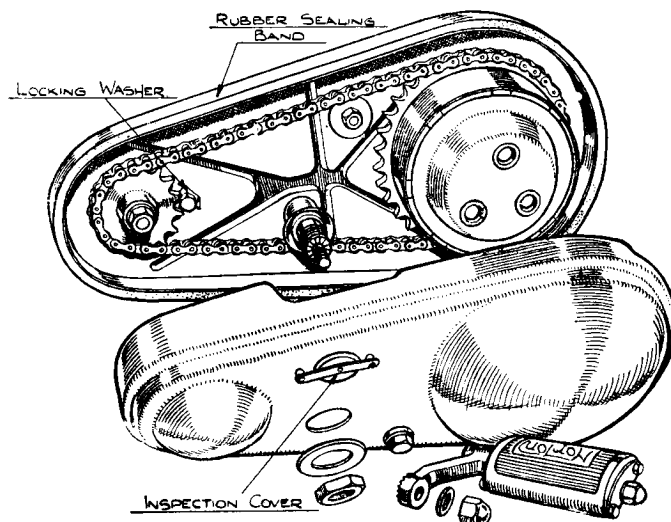


Fig. 6

Remove the footrests, footrest rod, and brake pedal.

Remove the large nut holding the outer portion of the oil bath, and remove the outer portion.

Remove clutch spring screws, springs and cups (three of each), clutch outer plate, clutch thrust pin, and clutch retaining nut.

Engage low gear and obtain assistance to hold the rear wheel while the nut is being removed.

Remove clutch body.

A special tool may be obtained for this purpose if necessary.

Remove engine sprocket (a claw-type extractor will remove this), and engine sprocket, clutch and chain can be removed together.

Remove rear portion of oil bath, held to the crankcase by bolt, to the engine plate by a nut, to the rear chain guard by a bolt, and by a nut on the gear box pivot bolt.

42. FITTING OF OIL BATH.

Assemble in the reverse order.

Examine rubber washer fitted round the

flange of the inner portion. This must be in a good condition to retain the oil in the case.

Fill oil bath with oil to the level of the plug near the bottom of the outer portion of the oil bath.

43. CLUTCH—TO DISMANTLE.

Remove outer portion of the oil bath, and clutch (Para 41).

A steel band is pressed round the clutch sprocket to prevent an excess of oil entering the clutch plates.

The plates can be removed with the band in position, but it must be removed to examine the driving slots in the sprocket.

Remove circlip holding clutch plates on to the body.

Remove plates.

There are six plain steel plates, and five steel plates with ferodo inserts.

Remove clutch sprocket.

Place an old gearbox main axle (if available) in a vice with the splined end above the jaws, and fit body to axle.

Remove the three screws holding the front cover plate.

Remove the cover plate, and the clutch shock absorber rubbers. (Fig. 7).

A large "C" spanner is needed to remove the rubbers. This is placed over the body and engaged in the splines, and the large rubbers compressed while the small ones are removed.

The handle of the spanner should be of such a length that the load can be taken by the user's thigh, allowing both hands to be free to remove the rubbers.

A substitute for a "C" spanner can be made by fixing a handle to an old plain steel clutch plate.

Compress large rubbers and remove the small.

A small, sharp-pointed tool is necessary to remove the rubbers, as after use they adhere to the body.

Large rubbers are easily removed, after the small have been withdrawn.

Remove body from axle and replace in the reverse position.

Remove the three stud nuts on the back cover plate.

Back plate, roller race, back cover and body can be separated.

44. EXAMINATION OF CLUTCH PARTS.

Examine clutch inserts. They should be "proud" of the plate.

Fitting of separate inserts to a plate is not

advisable, as the new insert would be "proud" of the remainder and take all the drive on the plate in which it had been fitted.

It is advisable, if possible, to replace plates with either new or reconditioned ones.

If all the new inserts are fitted to a plate, ensure that the inserts are level and flat and all contact the steel plates, taking their share of the drive.

Examine the drive on the plates for wear.

The plates with the inserts, drive on the outside diameter, and the plain steel, on the inside.

The splines on the body and the plain steel plates driven by the body rarely show any sign of wear.

The tongues on the plates with inserts, driving the sprocket, may show signs of wear and they may have "cut" in to the driven part of the sprocket.

This wear obstructs the free movement of the plates when the clutch is operated.

This can be rectified by filing or grinding the tongues on the plates square. Also the edge of the driven part of the sprocket.

The only effect this will have on the clutch is a slight amount of "back-lash" when the clutch is engaged or disengaged.

Examine plain steel plates for any roughness. The back plate sometimes develops this fault.

Examine the roller race, rollers and the cage.

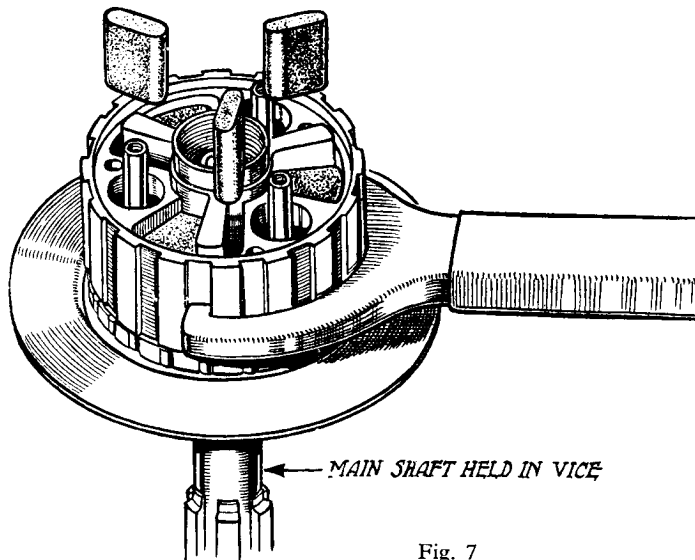


Fig. 7

Examine the back cover plate face for wear by the clutch body centre.

Examine clutch shock absorber rubbers. They may have become soft or cracked.

45. ASSEMBLY OF CLUTCH.

Fit clutch body back cover plate to body, ensuring that the holes in the cover plate are in line with the holes in the body, and the spring studs an easy fit.

Fit clutch body centre and fit clutch large shock absorber rubbers in the position to take the drive.

Compress the rubbers in position and fit the small ones.

Fit body front cover and tighten screws.

Fit roller race on to the back cover plate, fit clutch back plate, and spring studs, fit stud nuts and tighten. Lock nuts with a centre punch.

Test roller race for freeness on its track.

Fit steel band on to the sprocket. This should not be tight enough to distort the sprocket.

Check all the clutch plates in the sprocket and on body for freeness.

Fit sprocket to body. Revolve sprocket on race to check free movement.

Fit plates to sprocket and body. Order of fitting is—plain steel, inserts, plain, etc.

It will be noticed on examination that the plates are slightly bevelled on the one edge. Fit the bevelled edge towards the sprocket.

Revolve sprocket, ensuring that the plates are free.

Fit circlip, retaining the plates, and fit clutch to gearbox axle.

Fit clutch thrust pin, clutch outer plate, spring cups, springs, and spring pins. Tighten right home.

Fit oil bath outer portion. (Para. 42)

THE GEARBOX

46. REMOVAL OF GEARBOX FROM FRAME.

Remove kickstarter crank, gear indicator, and gear lever.

Remove gearbox outer cover and release clutch cable from clutch arm.

Remove cable adjuster from inner cover.

Remove oil bath outer portion, clutch and engine sprocket. (Para. 41.)

Remove rear portion of oil bath (para. 41), rear chain guard, held at the rear by a bolt and nut, and remove rear chain.

Remove rear wheel. (Para. 56.)

Remove toolbox held by three bolts, and rear mudguard, held by six bolts.

Remove large hexagon nut on the top gearbox bolt, also the two bolts holding the gearbox adjuster plate.

Unscrew the adjuster bolt from the gearbox bolt and withdraw the top gearbox bolt.

Remove the gearbox bottom bolt and nut, and lift gearbox from frame.

47. FITTING OF GEARBOX TO THE FRAME.

To refit the gearbox, reverse the order of the removal operations.

When fitting the top bolt, the tapped hole in the bolt must be in such a position as to allow the adjuster bolt to enter.

48. REMOVAL AND DISMANTLING OF GEARBOX END COVER.

Removal of end cover and gears may be readily carried out with the gearbox in position but for a complete overhaul it is best removed from the frame.

Remove split cotter and pin from the jaw joint on the control rod.

Remove the nuts holding the end-cover to the box, and remove end cover complete.

Remove kick-starter axle return spring and cover from the bush, and the kick-starter pawl pin from axle, when the pawl, plunger and spring are free.

Remove clutch worm lever from worm, also the clutch worm nut.

Pressed into the end cover is the steel bush that carries the kick-starter axle.

The head of the bush is recessed to take a compressed cork washer.

The end of the axle is bored out and a phosphor bronze bush is pressed in, to carry one end of the layshaft.

In the cover a ball journal bearing is pressed, to carry the end of the mainshaft (or axle).

Between this bearing and the kick-starter wheel, a dished steel washer is fitted, with the concave side next to the bearing.

The bearing can be pressed from the panel.

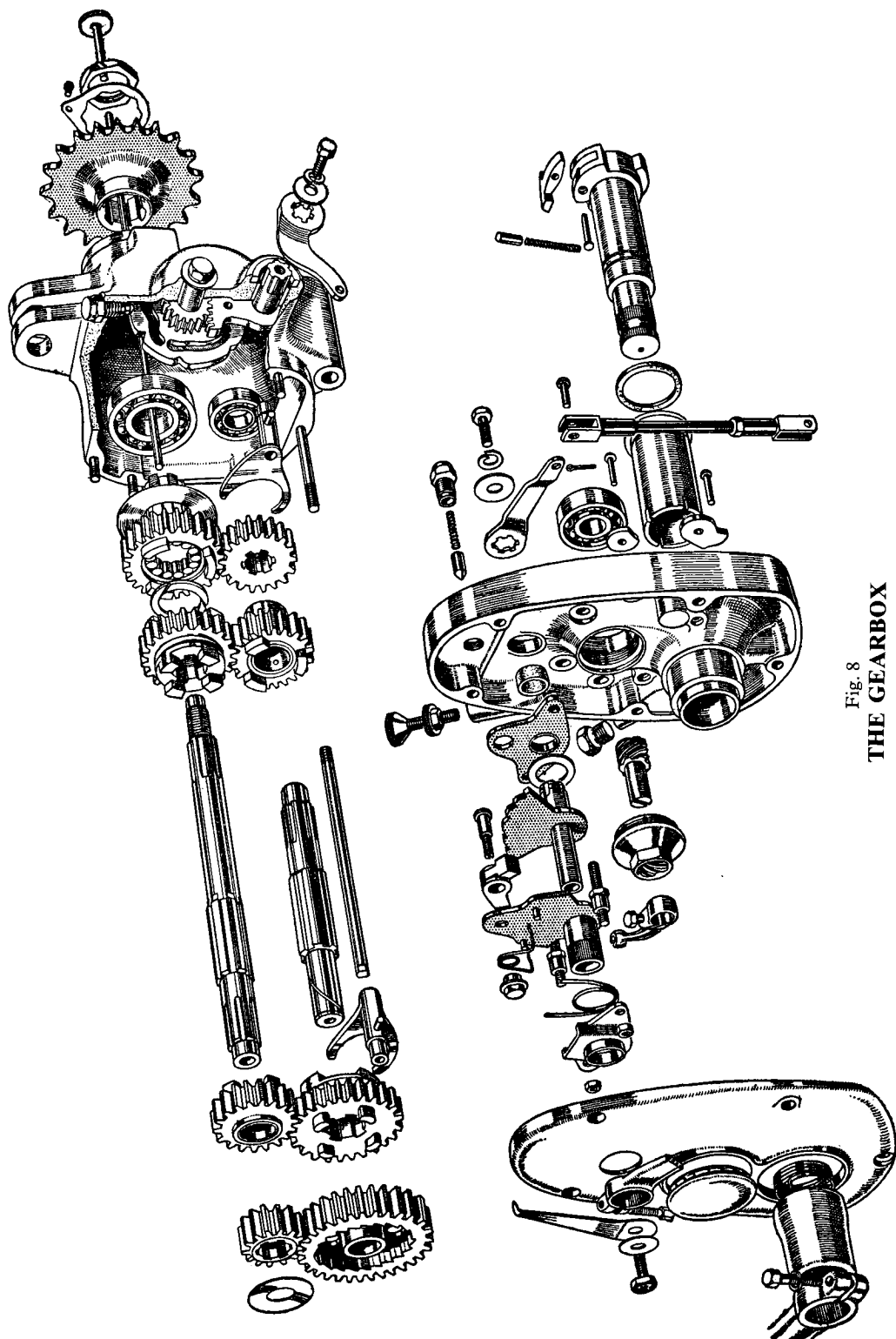


Fig. 8
THE GEARBOX

49. ASSEMBLY OF GEARBOX END COVER. (INNER.)

Press the kick-starter axle steel bush into the cover, also the ball journal bearing into the cover.

Examine kick-starter pawl. The tip of the pawl that engages with the kick-starter and low gear wheel is the portion where the wear takes place. If worn, replace.

Fit pawl, plunger and spring to axle, by placing in position and inserting the pawl pin.

Fit the clutch worm nut, clutch worm, and kick-starter axle.

Kick-starter crank, spring and cover and the clutch worm lever can be fitted before or after the cover is fitted to the box.

Fit dished steel washer to layshaft.

Fit cover to the box. A paper washer is fitted between the cover and the box.

Fit and tighten the seven nuts.

Fit clutch cable adjuster.

Fit clutch worm lever to worm.

Fit clutch cable to arm, adjust as necessary and tighten clip pin.

Fit outer cover, gear lever and gear indicator.

Fit kick-starter crank return spring; the end should be three slots round from its free position.

Fit kick-starter crank return spring cover.

Fit kick-starter crank to axle. The crank should not be upright. It should incline a little in the direction of its travel.

Fill gearbox with oil to the level of the filler-plug.

50. REMOVAL OF THE GEARS FROM THE GEARBOX.

Fit a length of steel tubing over the end of the gearbox main axle, from which the clutch has been removed, and retain by the clutch nut.

This will hold the axle in position while the gears are removed from the box.

Remove end cover. (Para. 48.)

Remove the low gear and kick-starter wheel—the large wheel on the layshaft. This has a phosphor bronze bush pressed into the centre.

Remove the small wheel on the main axle (or shaft), the main axle pinion.

Remove the second gear wheel from the main axle. This has a phosphor bronze bush, loose on the axle and in the wheel.

Remove the striker fork shaft, by screwing out of the box with a spanner on the machined flats at the end.

Remove the lay shaft second gear and the striker fork.

Remove the main axle and third gear and the striker fork.

Remove the layshaft with its two remaining gears, exposing the roller race at the far end of the box.

The inner race with the rollers and cage will remain on the shaft, leaving the outer race in the box.

51. REMOVAL OF THE CAM PLATE FROM THE GEARBOX.

Remove the domed hexagon nut from the top of the gearbox. This contains the cam plate indexing plunger.

Remove the plunger and spring.

Remove the cam plate quadrant lever held by a bolt and two washers, one plain and one spring.

Remove the cam plate quadrant, held by a bolt and two washers, one plain and one spring.

Remove the cam plate.

The cam plate quadrant works in a phosphor bronze bush. This can be pressed from the box.

The outside of the boss carrying the bush is recessed to take a pressed cork oil retaining washer.

The cam plate spindle also works in a phosphor bronze bush that can be pressed out.

Remove the temporary tubular distance piece, fitted on to the clutch end of the main axle.

Remove the main axle carefully. The phosphor bronze thrust washer will remain on the axle.

If the axle has been carefully removed, the rollers in the main gear wheel should remain in position.

Fit a tin or cardboard tube to replace the main axle in the main gear wheel to retain the rollers in position.

Remove the gear box sprocket, held by a nut with a LEFT HAND THREAD. The nut is locked by a locking washer and screw.

If the gearbox is in the frame, obtain assistance to hold the rear wheel while the sprocket nut is removed.

If the gearbox is removed from the frame, the sprocket can be held by passing a length of old chain round the sprocket, holding the two ends in the vice. Obtain assistance to hold the box, and remove the nut.

When the sprocket is removed the main gear wheel can be removed from the box complete with rollers.

At the back of the main gear wheel a large pen-steel washer is fitted. This washer obstructs the oil flowing to the bearing in the box, allowing only sufficient to lubricate the bearing.

The bearing carrying the main axle can be pressed out of the box. At the back of the bearing a pen-steel washer is fitted between the bearing and the case.

The outer race of the layshaft bearing left in the case can be removed by carefully warming the case.

52. FITTING OF CAM PLATE.

If the bushes carrying the cam plate and quadrant spindles have been removed from the box, replace or renew.

Fit the quadrant to the box but do not fit the retaining bolt.

Round the circumference of the cam plate five "V" grooves are machined. The indexing plunger engages in these grooves. Each groove corresponds with a gear position.

Three of the grooves are close together. They are in the following order—bottom (first), neutral (the shallow one), and second.

The other two are third and top (fourth).

The cam plate gear must be meshed with the quadrant in such a manner that when the quadrant is moved to its extreme position in either direction, the end grooves have passed the plunger by an equal distance.

Fit the cam plate, meshing the teeth on the spindle with the teeth on the quadrant.

Fit plunger, spring and domed nut. Do not screw the nut down tight. Allow the plunger to lightly touch the circumference of the cam plate.

Turn the quadrant to its extreme position in one direction, and check the distance the groove has passed the plunger.

Turn the quadrant to its other extreme and again check the distance the groove has passed the plunger.

When the gears are correctly meshed, fit the cam plate retaining bolt and two washers, the spring washer next to the bolt head.

Tighten down the plunger domed nut.

Fit the compressed cork washer to the quadrant spindle.

Fit the quadrant lever to the shaft, using the splines that allow the highest position

for the lever with bottom gear engaged. If any attempt is made to fit the lever any higher, the lever will foul the boss carrying the quadrant spindle.

Fit bolt and nut, the spring washer next to the bolt head.

53. FITTING GEARS INTO GEARBOX.

Fit pen-steel washer to the boss before fitting main axle bearing.

Fit main axle bearing to box.

Fit layshaft bearing outer race to box.

Fit rollers into the main gear wheel, smearing the assembly with grease.

Fit the tin or cardboard tube used in dismantling to retain the rollers.

Fit large pen-steel washer to main gear wheel and fit main gear wheel to box.

Fit gearbox sprocket, tighten the nut, and fit the locking washer.

Remove carefully the tube holding the rollers in position in the main gear wheel.

Fit phosphor bronze thrust washer to the main axle so that the side with the oil grooves will be against the hardened steel washer in the main gear holding the rollers in position.

Place cam plate in second gear position.

Fit main axle to main gear wheel.

Fit the tubular distance piece used in dismantling, to the clutch end of the axle.

Fit third gear wheel (20 teeth) to the layshaft, followed by the top gear wheel (18 teeth).

Fit the inner race, with rollers and cage, to the end of the shaft.

Grease rollers, and fit shaft to box.

Fit striking fork to the main axle third gear (22 teeth) and fit third gear with the fork on to the axle.

Fit the second fork to the layshaft second gear (24 teeth) and fit the second gear with the fork to the layshaft.

The pegs on the striking forks fit in the cam plate slots.

With the gear box in the frame, little trouble will be experienced in holding the first fork in position.

Fit the first fork in position and hold with a screwdriver or similar tool while the second is placed in position.

Fit striking fork shaft and screw it into the case.

Fit the remaining gears.

The chamfered side of the main axle pinion (13 teeth) is fitted first.

Fit end covers. (Para. 49.)

Check adjustment of the control rod.

The adjustment of the rod should allow the pins in the jaw points to be free when top or bottom gear is engaged.

Remove tubular distance piece from axle.

54. DISMANTLING OF POSITIVE FOOT CHANGE.

Remove outer end cover. (Para. 46.)

Remove return spring cover plate, held by two nuts.

Remove return spring.

Remove pawl carrier. This slides off the ratchet plate spindle, complete with the pawls and pawl spring.

Remove the ratchet lever, held to the back of the control box by a bolt with a spring and plain washer.

Remove the ratchet plate. At the back of the plate a plain steel washer is fitted.

At the back of the control box a plunger is fitted. The plunger engages in the back of the ratchet.

Remove the ratchet plunger by removing the dome nut at the back of the box, releasing the plunger and spring.

Remove the two nuts at the back of the box. These nuts lock the pawl carrier stop studs.

Remove the pawl carrier stop studs, screwed into the box.

Remove the cam plate.

Remove the pawls from the pawl carrier by removing the sleeved nut on the pawl pin. The end of the pawl pin with the

screwdriver slot will have to be held while the nut is removed.

When the nut is removed, the pawls and the return spring are free.

55. ASSEMBLY OF POSITIVE FOOT CONTROL.

Fit the pawls and spring to the pawl carrier. When the nut is tight, the pawls must have free movement.

Place cam plate in position and fit the two carrier stops holding the cam plate.

Fit the carrier stop stud locknuts at the back of the box.

Fit the ratchet plate, the splined end of the spindle through bush in the cam plate, the steel washer between the ratchet and box.

Fit the felt washer on to the splined end of the shaft and into the boss on the back of the box.

Fit the ratchet lever, as high as possible with the bottom gears engaged.

Fit the remaining bolt and washers, the spring washer next to the bolt head.

Fit the plunger and spring.

Fit the pawl carrier complete with the pawls. The pawls can be sprung into position with a screwdriver.

Fit return spring cover and the two nuts and grease as necessary.

Fit outer cover, gear lever, and gear indicator. Fit kick-starter crank.

WHEELS AND HUBS

56. FRONT WHEEL, REMOVAL.

Place machine on both stands. Detach brake cable from cam lever and cable adjuster from brake plate. Remove spindle nut from off-side of spindle. Slacken pinch bolt in near side fork end. Take the weight of the wheel in the left hand and withdraw the spindle by means of a tommy bar placed through the hole in the head of the spindle.

57. FRONT WHEEL, FITTING.

Re-assemble in the reverse order. Insert spindle from near side. Lock pinch bolt in near side fork end after tightening the spindle nut.

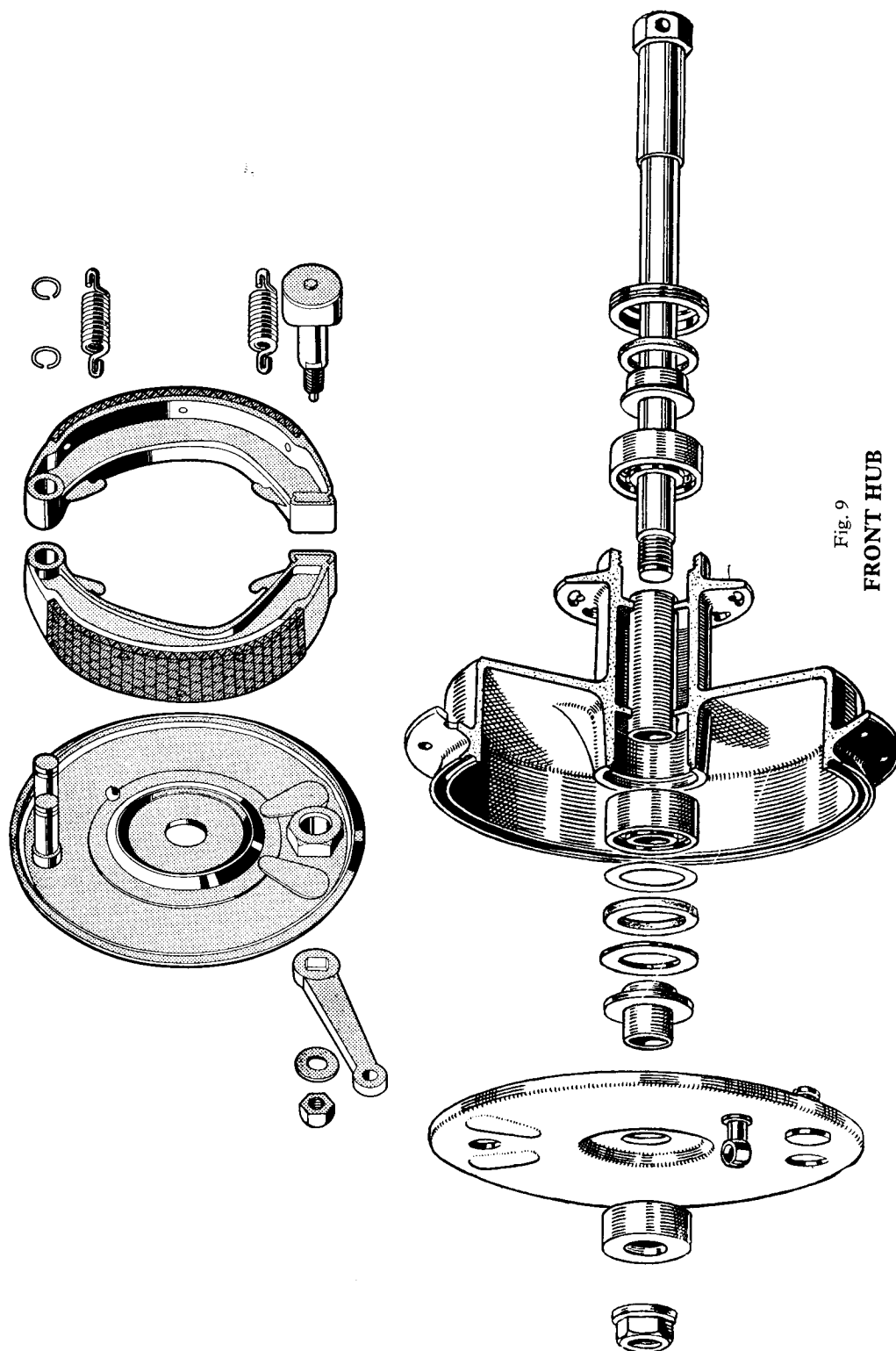
58. REAR WHEEL, REMOVAL RIGID FRAME.

Place machine on the rear stand. Roll back the rubber tube on the rear lamp lead, exposing the brass connection. Break the wire by parting the connector. Remove the tail piece of the mudguard by removing the two bolts holding it to the main portion and the two bolts at the bottom of the tail piece holding the stays.

Disconnect speedometer driving cable. Remove wheel spindle, distance piece and speedometer driving box.

Remove the hub stud nuts, draw the wheel clear of the three studs and the wheel will drop to the ground.

When the wheel has been removed by the



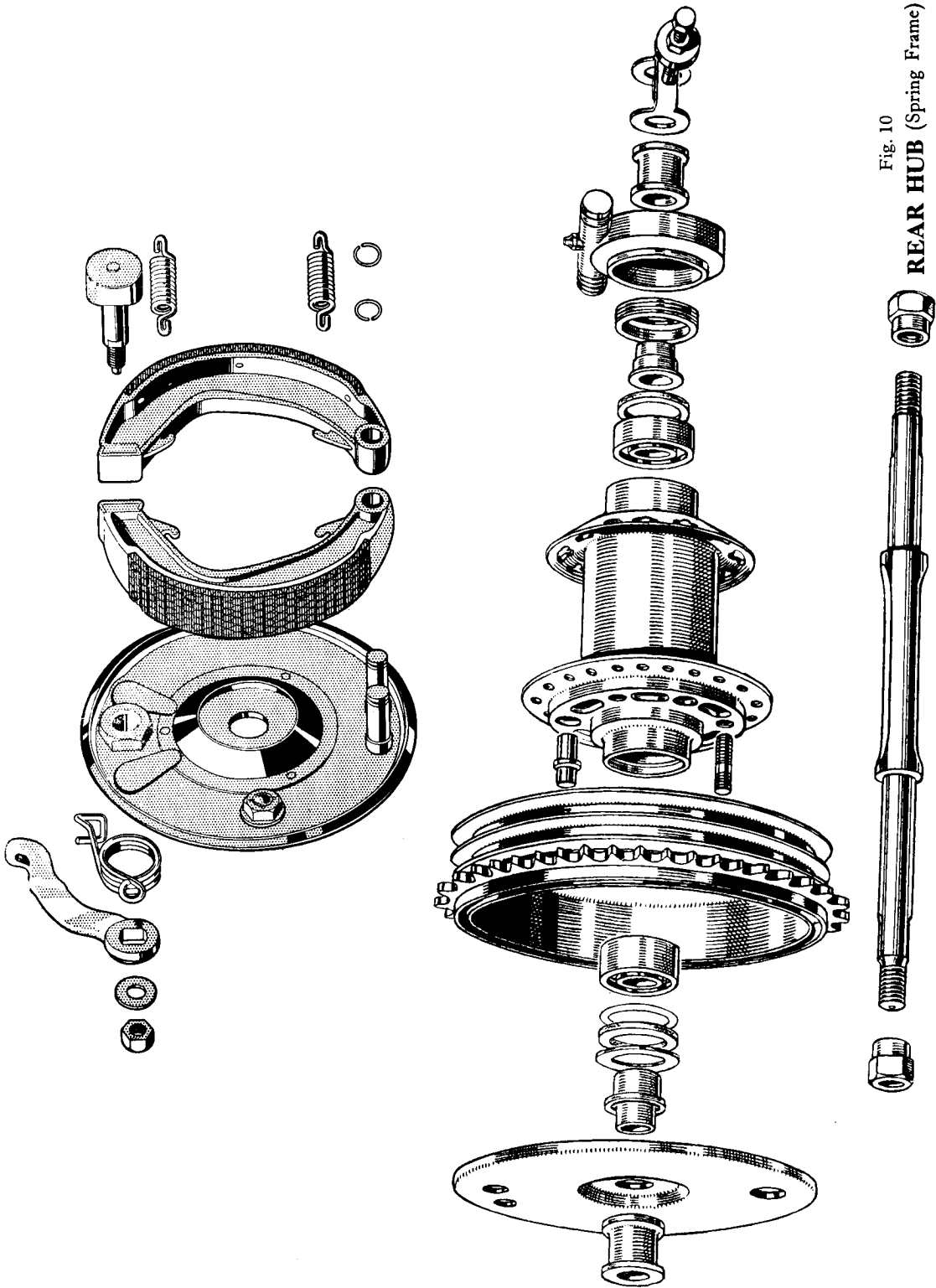


Fig. 10
REAR HUB (Spring Frame)

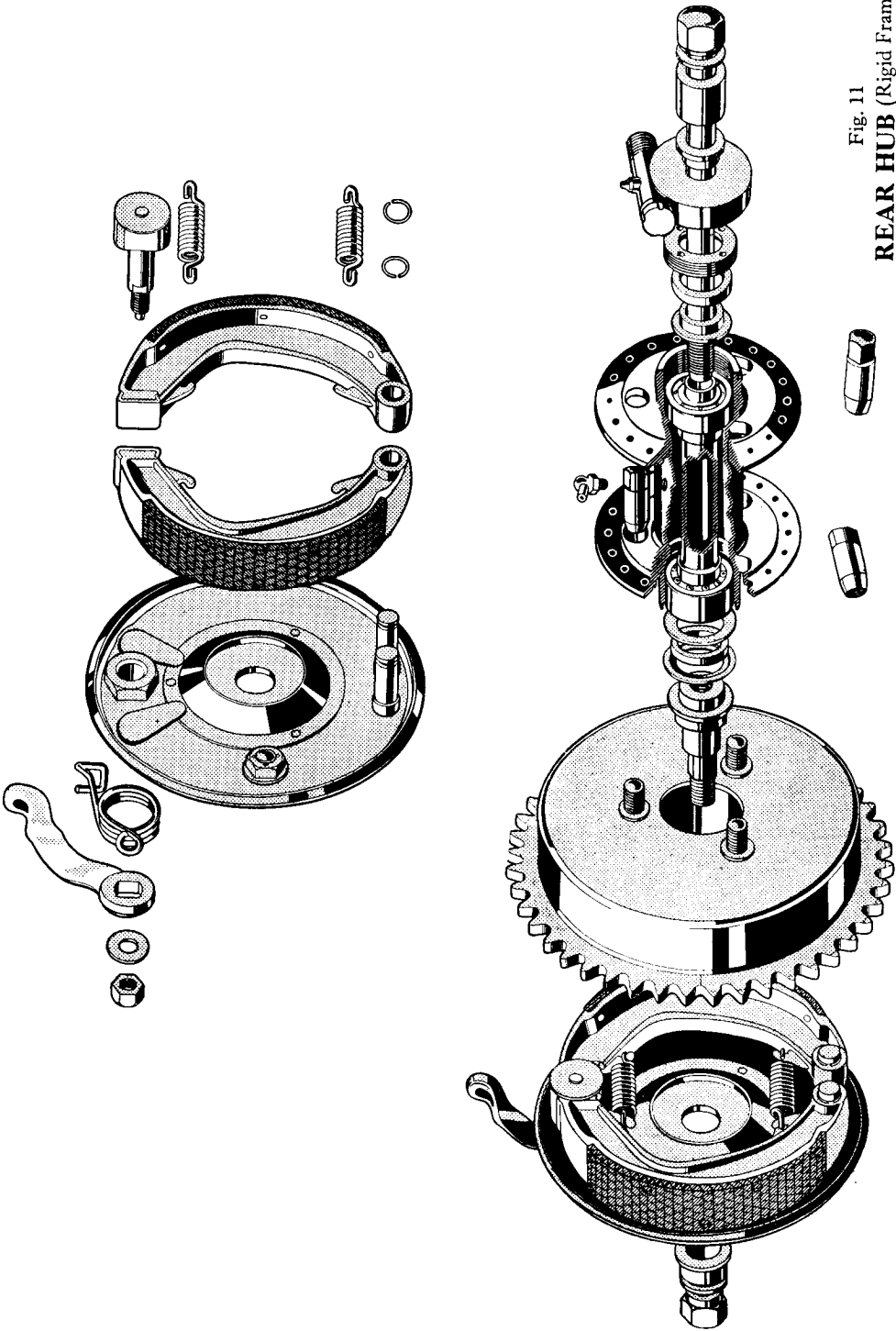


Fig. 11
REAR HUB (Rigid Frame).

above method, the brake drum is left in position.

To remove the wheel complete with brake drum, remove tail piece of mudguard, rear chain, anchorage bolt holding the brake anchorage arm to the frame and ease the spindle nuts, when the wheel can be removed from the fork ends of the frame.

59. REAR WHEEL, FITTING. RIGID FRAME.

When re-fitting the wheel, reverse the removal operations.

Ensure that the spindle is hard against the chain adjusters.

When re-fitting the chain spring link ensure that the closed end of the spring faces the direction of travel of the chain.

Check rear brake.

60. REAR WHEEL, REMOVAL. SPRING FRAME.

With machine on rear stand, remove rear chain and mudguard tail piece. Disconnect tail lamp lead at the brass connection.

Remove brake rod adjusting nut. Disconnect speedometer drive. Slacken rear wheel spindle nuts and withdraw the wheel from the fork ends.

61. REAR WHEEL, RE-FITTING. SPRING FRAME.

See that fork ends are lying reasonably parallel. Place wheel in position ensuring that the ears of the adjusting stirrup are lying flat against the sides of the fork end and that the cupped adjuster washer is located on the small shoulder at the open end of the fork end slot.

Make sure that the anchor pad on the brake plate is entering the slot on the inside of the near-side fork end.

Fit rear chain with the closed end of the spring connecting clip facing the direction of travel of the chain.

Track up the wheel and adjust until there is $\frac{3}{8}$ " to $\frac{1}{2}$ " up and down movement midway between the sprockets.

NOTE.—It is important that this condition is obtained with the weight of the machine on the rear wheel.

Adjust brake rod as necessary. Reconnect speedometer drive.

62. DISMANTLING SPRING FRAME REAR HUB.

Remove rear wheel complete. (Para. 60.) Remove spindle nuts, adjusting stirrups,

brake plate, speedometer driving box and distance pieces.

Remove ball-race locking ring from plain side of hubshell.

Remove distance piece and felt washer. Knock out the spindle and it will bring with it the single row bearing fitted to the plain side of the hub.

Drift out the remaining bearing together with the peened in washer, the felt and pen steel washers fitted into the brake drum side of the hubshell. Separate brake drum and hubshell if necessary.

63. RE-ASSEMBLING SPRING FRAME REAR HUB.

Re-assemble in reverse order.

Pack bearings with grease before assembly. Ensure that long end of spindle protrudes through the brake side of the hub.

64. REAR HUB, DISMANTLING. RIGID FRAME.

Remove rear wheel. (Para. 58.)

Remove locking ring, felt washer and distance piece from plain side of hub.

Drift out inner sleeve, it will bring with it the single row bearing.

Using a suitable punch knock out the bearing in the brake side of the hub, together with the peened in washer, felt washer and pen steel washer.

65. REAR HUB, RE-ASSEMBLY. RIGID FRAME.

Pack bearings with grease.

Fit single row bearing to screwed side of hub.

Fit inner sleeve, the long end into the single row bearing.

Fit distance piece, felt washer and locking ring and tighten.

Press double row bearing into position in opposite side of hub, followed by the pen steel washer, felt washer and the dished washer. Lightly rivet the dished washer into position.

66. FRONT HUB, DISMANTLING.

With machine on both stands remove front wheel. (Para. 56.)

Remove brake plate together with its inner and outer distance piece.

Remove locking ring, felt washer and distance piece from opposite side of hub.

With suitable punch knock the bearing in the brake side further into the hub, until the single row bearing drops clear.

Remove distance tube.

From this side of the hub, drift out the remaining bearing, together with the peened in washer, felt washer and pen steel washer.

67. FRONT HUB, RE-ASSEMBLING.

Pack bearings with grease.

Press single row bearing into position followed by the distance piece (with collar

against the bearing), felt washer and locking ring which can be tightened up.

Insert distance tube through brake side of hub, ensuring that it is right home against the bearing just fitted.

Press double row bearing into position.

Fit pen steel washer and felt washer.

Lightly rivet remaining washer into its recess.

BRAKES

68. DISMANTLING OF THE BRAKES.

Remove brake plate from the drum.

Remove brake lever return spring from the lever.

Remove nut and washer from the cam spindle.

Remove brake lever.

Remove cam and spindle from bush in the brake plate.

Tap the end of the spindle lightly until the cam is clear of the shoes.

Remove brake shoe return springs.

Remove the circlips retaining shoes to the pivot pins.

Remove the brake shoes.

Cam spindle bush can be removed from the plate after removing the nut holding bush to the plate.

69. ASSEMBLY OF BRAKES.

Fit cam spindle bush to plate.

Fit brake shoes. Smear a little oil on the pivot pins.

Fit ONE shoe to pivot pin.

Fit spring to the shoe fitted to the pin, near pin.

Hold second shoe near to the one fitted and fit the spring, stretch the spring and fit second shoe to pivot pin.

Fit second spring to both shoes.

Fit cam spindle to plate. Hold shoes apart with screwdriver or similar tool and allow cam to pass the ends of the shoes.

Fit NEW circlips to pivot pins.

This is simplified if a length of rod is obtained with the same diameter as the pivot pin.

Fit circlip to the rod.

Place a piece of tubing over the rod. Place rod at the end of the pivot pin. Tap end of tube and circlip is forced on to the pin and into the groove.

FRONT FORKS

70. MAINTENANCE.

Replenish damping oil at approximately 5,000 mile intervals.

Remove hexagon headed filler plug from top of each fork leg. Remove drain plug from each fork end. Allow oil to drain out and operate the forks a time or two to eject the last drops.

Replace drain plugs.

Refill each leg with a measured $\frac{1}{4}$ pint of Wakefield's Castrolite, Shell X-100-20, B.P. Energol S.A.E. 20 or Mobiloil Arctic. Work the forks a few times to remove any air locks.

Replace filler plugs.

71. STEERING HEAD ADJUSTMENT.

Place a wooden block or box under the engine cradle of sufficient height to raise the

front wheel clear of the ground. Place thumb of left hand on the joint between the steering head of the frame and the fork head clip.

Attempt to lift the forks with the right hand. Any movement at the head races will be readily felt.

To adjust, slacken the steering column locking nut and the pinch bolt clamping each leg into the fork crown.

Adjust by means of the nut situated on the steering column below the head clip, until all play is removed, but the forks are still free to rotate on the head races.

Re-tighten the steering column locking nut and the pinch bolts.

72. REMOVAL OF FRONT FORKS FROM FRAME.

This may be carried out either with or without the front wheel and mudguard in position.

Remove switch panel from headlamp.

Detach steering damper arm from frame.

Detach speedometer driving and lighting cables from speedometer head.

Remove all cables from the handlebar levers, remove handlebars.

Slacken off steering damper completely, remove steering column locking nut complete with damper knob and rod.

Remove oil filler plugs and speedometer panel.

Remove head clip and head race adjusting nut.

Withdraw forks carefully to avoid losing any head race balls.

Take care to avoid spilling any damping oil from the fork legs. If any oil is lost it will be necessary to replenish as instructed. (Para. 70.)

73. FITTING OF FORKS TO THE FRAME.

Examine head races and balls (17 per race).

Races are pressed into their housings and may readily be knocked out for renewal.

Note that the races fitted in the frame embody a small hole to allow the entry of grease.

Liberally grease the track in the race fitted to the bottom of the steering column and the top frame race. Place 17 balls in position in each and carefully insert the column through the frame.

Place the top race and dust cover in position and screw the adjusting nut down the column till the hexagon is finger tight against the top race.

Refit the head clip and speedometer panel, the column locking nut loosely and the filler plugs which should be tightened up.

Adjust the head races. (Para. 71.)

Re-fit all remaining parts and check that all bolts and nuts have been tightened.

74. FORK LEG, DISMANTLING.

This may be carried out with the forks in position, but before commencing the work it is advisable to obtain from our Service Department a "pull through" to facilitate removal and replacement of the main tube.

Remove front wheel. (Para. 56.)

Remove front mudguard.

Remove oil filler and drain plugs from top and bottom of fork leg and allow oil to drain off.

Slacken the pinch bolt in the crown lug.

Fork end, complete with bottom cover, springs and main tube may be withdrawn.

If difficulty is encountered the "pull through" already mentioned should be screwed into the top of the main tube which can then be tapped out with a mallet.

Remove from the main tube the top leather washer (this may have stuck to the inside of the upper cover), the short buffer spring and the main spring.

Remove the bottom cover, held to the fork end by two screws.

Remove leather washer.

Remove locking ring from top of fork end.

Withdraw fork end from main tube.

The remaining components may now be removed from the main tube.

75. FORK LEG, ASSEMBLY.

Thoroughly clean all components and obtain any renewals necessary.

Attach the bottom bush to the main tube by means of the securing nut.

Place fork end in position on the main tube.

Fit shouldered bush into fork end followed by the super oil seal, being very careful that the leather has its radiused side uppermost.

Screw home the locking ring and tighten sufficiently to be secure without distorting the case of the super oil seal.

Fit the smaller of the two leather washers over the locking ring followed by the main spring, the buffer spring, and the remaining leather washer.

Fit bottom cover and securing screws.

Screw "pull through" into top end of main tube and pass through crown lug and head clip.

Draw into position by means of tommy bar inserted across the "pull through," and temporarily tighten the pinch bolt in the crown lug.

Remove "pull through."

Fit filler plug to main tube and slacken pinch bolt. Lock main tube in position with filler plug. Re-tighten pinch bolt.

Fit drain plug to fork end.

Remove filler plug.

Replenish with oil. (Para. 70.)

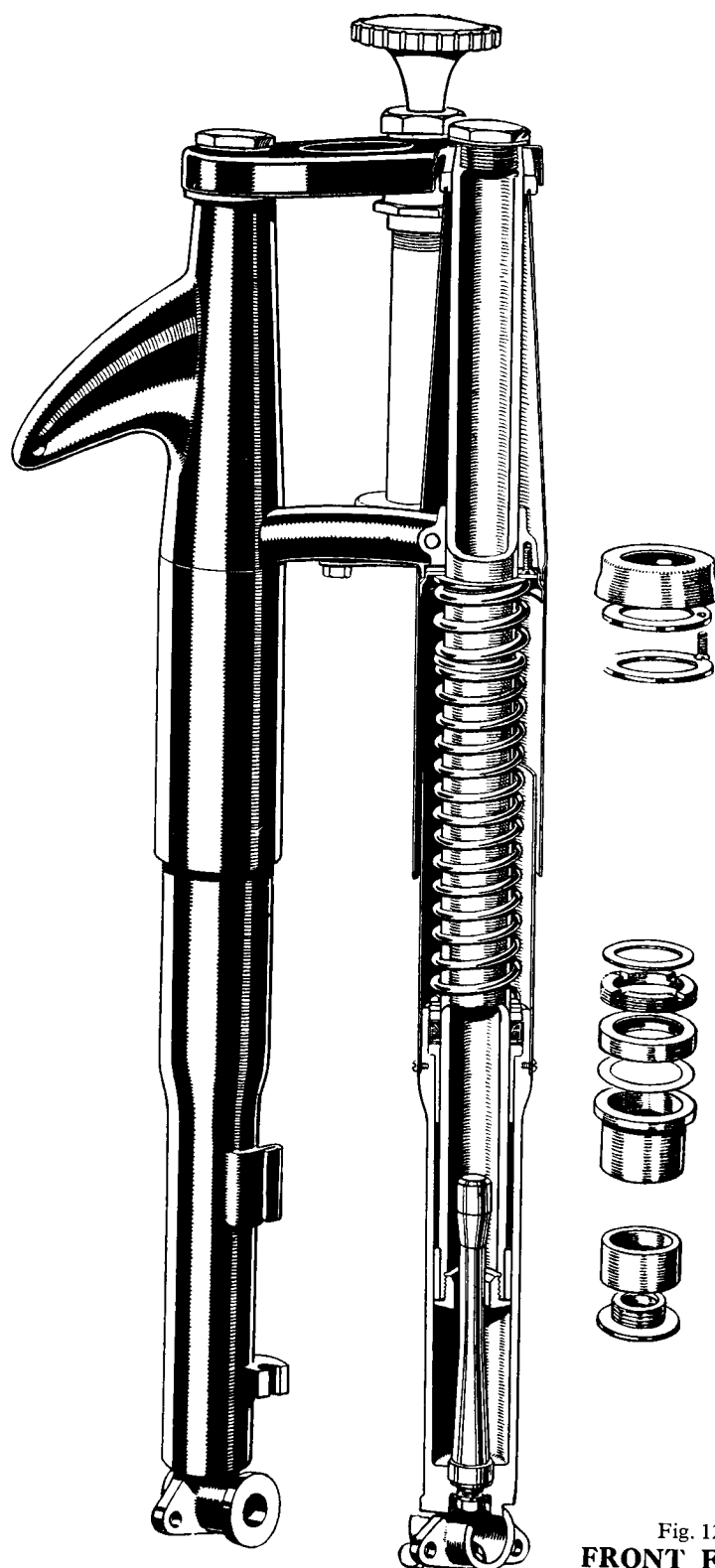


Fig. 12
FRONT FORKS

SPRING FRAME

76. DISMANTLING REAR SPRINGING.

Remove rear wheel. (Para. 60.)

Slacken the pinch bolt across the top of the rear frame member.

Unscrew the locking bolt at the bottom of stationary bearer rod a few turns and tap the bolt head with a hammer to release the bearer rod from its taper.

Remove bottom bolt.

Withdraw bearer rod upwards.

Insert a tyre lever or large screwdriver between the frame member and the side of the top and bottom spring covers.

Lever sideways until sufficient of the central hole is exposed beyond the edge of the rear member to insert a $\frac{1}{4}$ " or $\frac{5}{16}$ " diameter rod fitted with suitable washers and wing nuts into the hole to prevent the assembly flying apart when completely removed from the frame.

77. RE-ASSEMBLY OF REAR SPRINGING.

Thoroughly clean all components and smear the bearing surfaces with oil or grease.

Fit the springs and covers to the fork ends and compress the assembly by means of the rod used during dismantling, until it is sufficiently compressed to enter the jaw of the rear member.

Place the assembly as far as possible into the jaw, remove the rod and tap the assembly into an approximately central position.

Smear the bearer rod with oil and insert taper end first into the upper end of the rear frame member.

Push or tap the bearer rod right home.

Fit and tighten bottom bolt.

Tighten top pinch bolt.

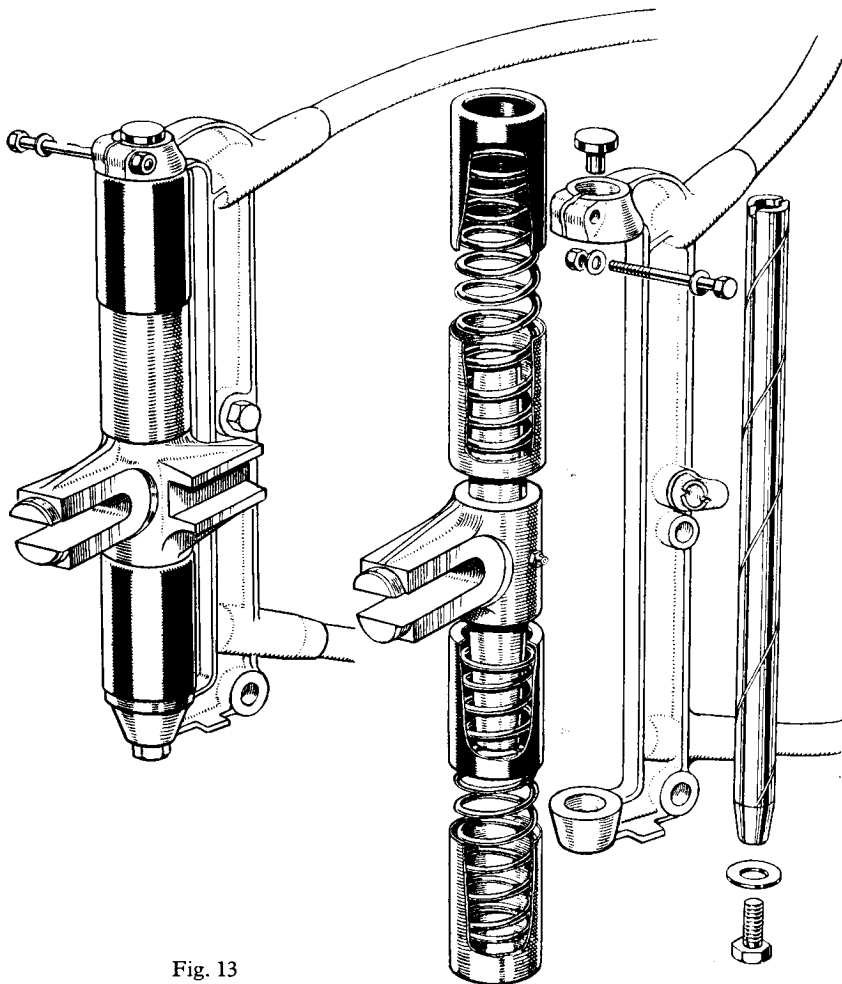


Fig. 13

HANDLEBAR FITTINGS

78. IGNITION AND AIR CONTROL LEVERS.

The ignition and air control levers are shown in Fig. 15 in the position in which they should be assembled, having first greased both sides of the lever.

After fitting the adjusting nut it should be tightened to give the required tension.

To remove the control cables from the lever, open the lever as far as possible, hold the outer cable, and as the lever is closed, pull the outer cable from the lever body.

Remove nipple from the lever.

To fit the cables, fit nipple into the lever close the lever, pull the outer cable away from the lever and fit the cable to the lever body.

79. CLUTCH AND FRONT BRAKE CONTROL LEVERS.

The clutch and front brake controls are so simple as to require no instructions for their dismantling and assembly.

The pivot bolts have shoulders machined on them, allowing the nuts on the bolts to be tightened while allowing clearance for easy movement of the lever.

To remove the clutch cable from the lever, turn the clutch operating arm on the clutch worm by other means than the cable, and the nipple can be removed from the arm, and inner and outer cables can be removed from the lever.

To remove the brake cable from the lever, remove the split cotter and pin holding the "U" clip to the brake arm, and the inner and outer cables can be removed from the lever.

Re-assemble in the reverse order.

80. EXHAUST LIFTER LEVER.

The arrangement of the exhaust lifter lever is similar to the clutch and brake, only smaller.

To remove the cables from the lever, turn the operating arm on the exhaust lifter by other means than the cable and remove the inner cable from the arm. Remove the nipple on the other end of the cable from the lever and the nipple will pass through the large hole in the lever body.

When re-assembling, the cables must be fitted to the lever first.

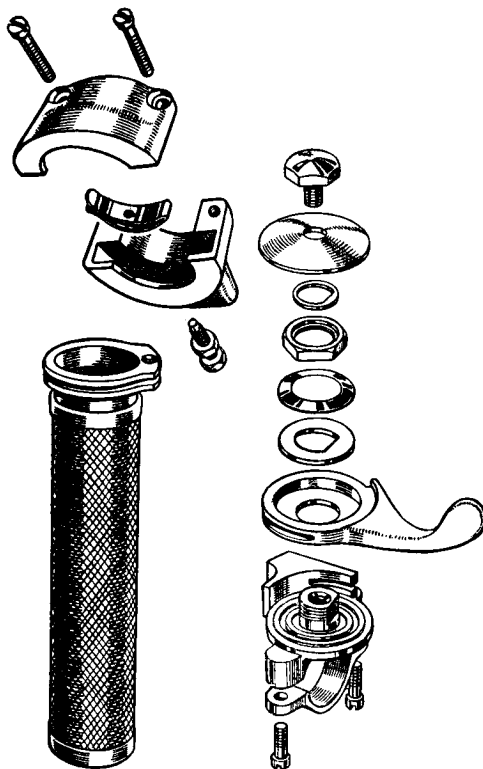


Fig. 14

TWIST GRIP

Fig. 15

IGNITION AND
AIR CONTROL.

81. TWIST GRIP.

The twist grip assembly is shown in Fig. 14.

To assemble the twist grip, grease the portion of the handlebar where the grip works.

Fit the sleeve to the bar.

Grease the drum on the sleeve.

Fit spring and adjuster bolt and nut to the bottom half clip.

Thread the cable through the hole in the half clip.

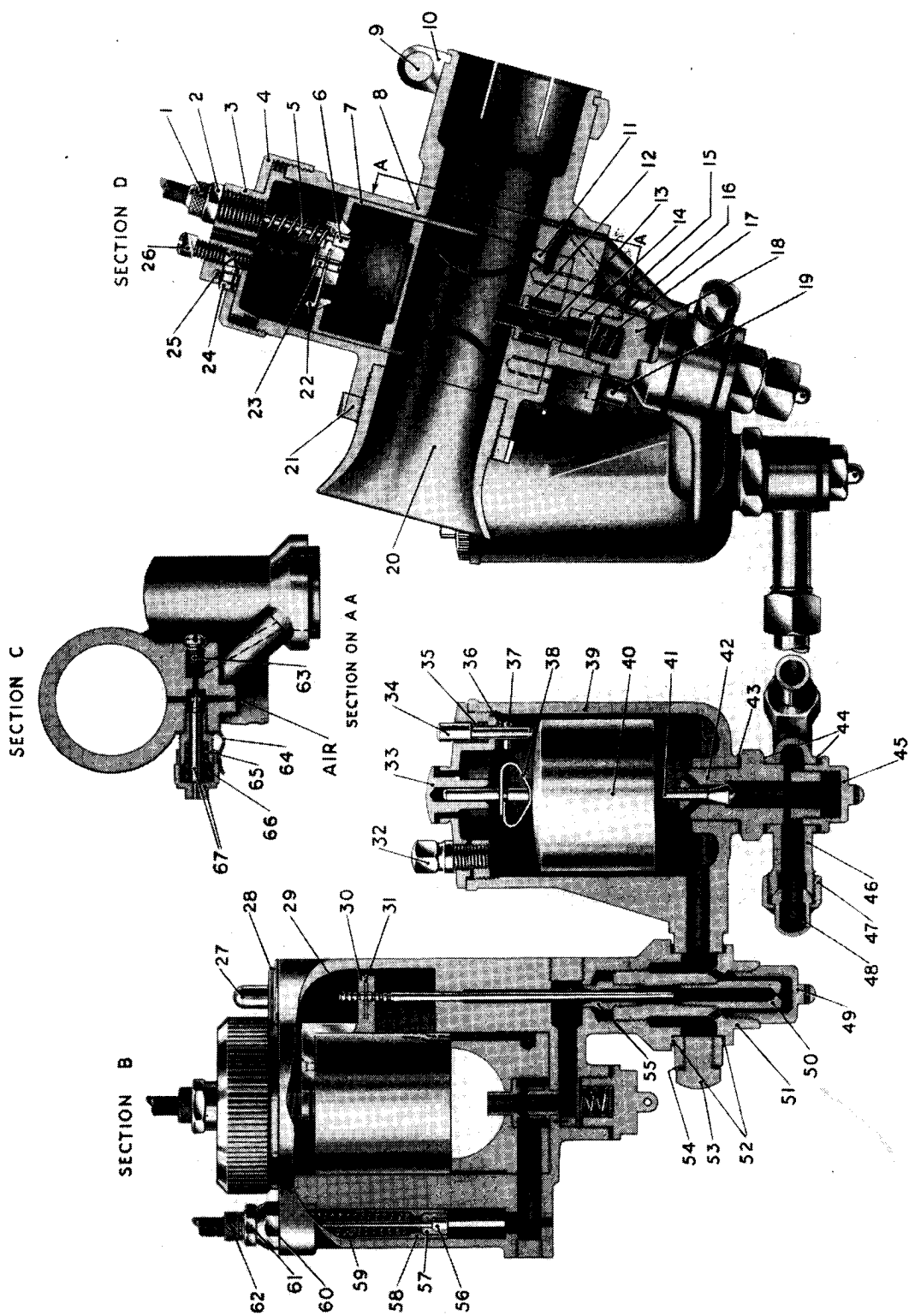
Fit the nipple to the drum on the sleeve.

(Sufficient length of cable can be obtained by lifting the throttle slide and holding in position by piece of soft wood placed in the air intake.)

Fit the top half clip.

Adjust the tightness of the grip with the adjusting screw and lock in the desired position.

Dismantle in the reverse order.



KEY TO R.N. CARBURETTOR ILLUSTRATED ON OPPOSITE PAGE

- | | |
|---|---|
| 1. Throttle Cable Adjuster | 36. Tickler Fibre Washer |
| 2. Throttle Cable Adjuster Locknut | 37. Tickler Cotter |
| 3. Mixing Chamber Top | 38. Float Bow Spring |
| 4. Mixing Chamber Cap | 39. Float Chamber |
| 5. Throttle Valve Spring | 40. Float |
| 6. Throttle Valve Nipple | 41. Float Needle |
| 7. Throttle Valve | 42. Float Chamber Needle Seating Washer |
| 8. Mixing Chamber | 43. Float Chamber Needle Seating Washer |
| 9. Outlet Clip Pin | 44. Banjo Washers (Float Chamber) |
| 10. Outlet Clip | 45. Banjo Nut (Float Chamber) |
| 11. Choke Adaptor | 46. Banjo (Float Chamber) |
| 12. Primary Choke | 47. Petrol Pipe Union Nut |
| 13. Mixing Chamber Choke Tube | 48. Petrol Pipe Union Nipple |
| 16. Mixing Chamber Base Plug Washer | 49. Jet Holder Plug |
| 18. Mixing Chamber Base Plug | 50. Main Jet |
| 19. Choke Adaptor Screws | 51. Jet Holder |
| 20. Air Tube | 52. Jet Holder Washers |
| 21. Air Tube Lock Ring | 53. Float Chamber Feed Hole Plug Screw Washer |
| 22. Needle Clip for Cable Stop Peg | 54. Float Chamber Feed Hole Plug Screw Washer |
| 23. Cable Stop Peg | 55. Metering Needle Jet |
| 24. Lock Plunger for Mixing Chamber Cap | 56. Air Valve Nipple |
| 25. Rivet for Lock Plunger | 57. Air Valve Nipple Carrier |
| 26. Lock Plunger Screw | 58. Air Valve |
| 27. Needle Chamber Top Cap | 59. Air Valve Spring |
| 28. Needle Chamber Top Cap Spring | 60. Air Barrel Top |
| 29. Metering Needle | 61. Air Valve Adjuster Lock Nut |
| 30. Needle Carrier | 62. Air Valve Adjuster |
| 31. Spring Clip for Needle | 63. Pilot Feed Hole Plug Screw |
| 32. Float Chamber for Locking Screw | 64. Pilot Adjuster Spring Catch |
| 33. Float Chamber Cover | 65. Pilot Adjuster Insert |
| 34. Tickler | 66. Pilot Adjuster Spring |
| 35. Tickler Spring | 67. Pilot Adjusting Needle |

AMAL CARBURETTER — T.T. TYPE

STANDARD 30 & 40 MODELS.

82. SEQUENCE OF TUNING.

Main jet size.
Pilot jet adjustment.
Throttle valve cutaway.
Needle attachment.

83. MAIN JET SIZE.

This should be determined first. The smallest jet which gives the greatest maximum speed should be selected, bearing in mind the safety factor for cool running. The air lever should be fully open during these tests.

84. PILOT JET ADJUSTMENT.

This adjustment should be made with the engine at its normal working temperature. 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 too slow a tick-over does not lead to a "spot" which may cause stalling when the throttle is slightly open.

85. THROTTLE VALVE CUTAWAY.

Having set the pilot adjuster, open the throttle a little and note any position where the exhaust note tends to become irregular. Leave the throttle in this position and slightly close the air lever. This will indicate whether the "spot" is rich or weak. If rich, fit a throttle valve with more cutaway on the air intake side and vice-versa if weak or the engine "spits."

86. NEEDLE ATTACHMENT POSITION.

Beyond about $\frac{1}{4}$ throttle position, the jet needle 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 described, the needle can be raised to enrich or lowered to weaken the mixture as necessary.

When these adjustments are correctly made a perfectly progressive mixture will be obtainable from tick-over to full throttle.

87. COMPENSATION AND AIR CONTROL.

Petrol through the main jet first passes through the needle jet and is there partially atomised by a blast of primary air and passes as a rich mixture through a primary choke, visible at the base of the main choke. The mixture passing through the primary choke can be handlebar regulated by the air control: less air being admitted for cold starting or conditions demanding more liquid fuel. As the engine speed increases at a given throttle opening, so the mixture would tend to become rich, but as the air flow through the primary choke also increases, there is a damping effect on the flow of liquid and a compensated mixture is obtained.

88. FAULTS.

Flooding at the float chamber may be due to impurities in the fuel, a bent or worn needle or a punctured float. Other trouble can only be due to a weak or rich mixture which can be remedied in any of the four phases of throttle opening. Generally speaking, a weak mixture causes spitting or overheating. Richness may be indicated by bumpy running, black smoke or a sooty plug.

Before trying to correct any fault, determine at which phase of throttle opening it occurs and tune accordingly.

AMAL REMOTE NEEDLE CARBURETTER

MODELS 30 M & 40 M.

89. TUNING.

Sequence of tuning and tuning procedure is identical with the T.T. type carburetter, see paras. 44—50. Note that when testing for main jet size, if it should be found that the performance is improved by closing the air valve, it is an indication that the main jet should be three or four sizes larger.

Note also that the throttle valve cutaway is marked on the top of the valve, a number 6 cutaway giving a weaker mixture than a number 5, etc.

Approximate jet sizes for 50/50 Petrol Benzol mixture are as follows, assuming a megaphone exhaust is fitted:—

Model 30 M.	...	No. 620.
Model 40 M.	...	No. 520.

For use with a Brooklands Silencer, fit one size smaller jet.

NOTE.—The standard R.N. carburetter is not suitable for use with Methanol or any fuels calling for a jet size larger than 800. For information regarding carburetters for use with alcohol fuels contact our Service

Department or Messrs. Amal, Ltd., direct. The use of an alcohol fuel always necessitates a main jet size approximately $2\frac{1}{2}$ times larger than for Petrol-Benzol, thus if the usual jet is, say 640, the approximate alcohol jet will be 1600.

90. PREPARATION FOR RACING.

Ensure that throttle works freely when handlebars are turned in either direction.

See that there is ample petrol supply from tank to jet. Check that tickler in float chamber lid springs up. Tighten mixing chamber top cap ring and locking screw. Check that locking screw in float chamber lid is tight.

Lock cable adjuster nuts.

Wire up the following parts:—

- Main jet cap.
- Choke adaptor screws.
- Banjo nut (float chamber).
- Mixing chamber base plug.
- Float chamber feed hole plug screw.

TYRES

91. MAINTENANCE.

Keep tyres at correct pressures. See data sheet.

Examine regularly and remove any flints, etc., which may have become embedded in the tread.

Replace valve cap as soon as possible should one become lost.

92. REMOVAL.

Deflate tube by removing valve inner.

Remove valve nut and push the bead of the cover into the well of the rim at a point opposite the valve, and proceed to remove cover, commencing at the valve.

Remove one side completely.

Remove tube and other side of cover.

93. FITTING.

Lubricate with french chalk the cover beads, inner tube, and inside of rim.

Fit one side of cover, fit inner tube and inflate slightly.

Ensure that valve is protruding squarely through the rim.

Fit remaining side of cover, commencing opposite the valve and forcing the cover into the well of the rim.

Inflate to recommended pressure.

ELECTRICAL SECTION

94. ESSENTIAL MAINTENANCE.

Battery. Inspect the battery regularly and keep acid level to the top of the separators by adding distilled water.

UNLESS YOU DO THIS YOUR BATTERY WILL QUICKLY DETERIORATE.

Wiring. Keep all connections and terminals tight. See that the cables are clear of moving parts.

Dynamo. Keep brushes and commutator clean. (Para. 93.)

Magneto. Keep contact breaker clean. If necessary polish the contacts with fine carborundum stone or emery cloth and afterwards wipe with cloth moistened with petrol. (Para. 88.) Occasionally check contact breaker opening (using gauge on ignition spanner). (Para. 87.)

Replace high-tension cable if it becomes worn or perished.

Head Lamp. Focus head lamp after fitting new bulb. (Para. 98.)

IGNITION

95. LUBRICATION.

The cam is lubricated by a wick, contained in the contact breaker base, which must be given a few drops of thin machine oil about every 2,500 miles.

To get at the wick, remove the spring arm carrying the moving contact and withdraw the screw carrying the wick. (Fig. 16).

When replacing the contact breaker components see that the small backing spring is fitted immediately under the securing screw and spring washer, and that the bent portion faces outwards.

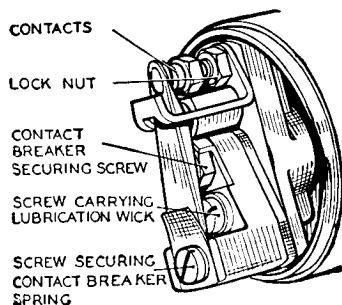


Fig. 16

96. ADJUSTMENT.

After dismantling the contact breaker in order to lubricate, the contact setting should be checked.

Turn the engine until the contacts are fully opened and insert the gauge provided, .010" —.012" thickness, between the contacts.

The gauge should be a sliding fit.

If there is an appreciable variation from the gauge, slacken the lock nut and turn the contact screw by its hexagon head until the gap is set to the gauge.

Tighten the lock nut.

97. CONTACT BREAKER—CLEANING.

Remove the contact breaker cover and examine the contacts.

If they are dirty, they must be cleaned by polishing with a very fine carborundum stone or very fine emery cloth; afterwards wipe away any dirt or metal dust with a petrol-moistened cloth.

Cleaning of the contacts is made easier if the spring arm carrying the moving contact is removed as described in paragraph 86.

Examine the spring arm of the contact breaker and wipe away any rust.

Adjust as described in paragraph 87.

98. H.T. CABLE.

Should be 7 m/m. in diameter, rubber covered ignition cable.

The cable must be replaced if the rubber insulation has perished or shows cracks and becomes brittle.

To fit the new cable to the pick-up terminal, thread the knurled moulded nut over the lead, bare the cable for about $\frac{1}{4}$ inch, thread the wire through the metal washer

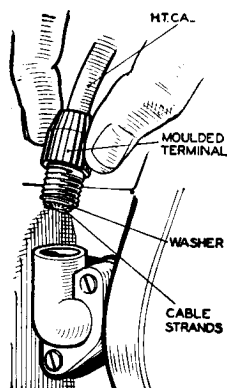


Fig. 17

removed from the old cable and bend back the strands.

LIGHTING AND ACCESSORIES

101. DYNAMO—TO REMOVE AND REPLACE.

Take off the connections from the dynamo terminals.

Unscrew the hexagon headed nut from the driving end cover of the Magdyno.

Slacken the two screws securing the band clip, and draw the dynamo out of its mounting.

When replacing, slide the dynamo through the band clip so that fixing screw passes through its hole in the end cover and the gears mesh correctly.

Tighten the end nut and the band clip fixing screws and remake the connections to the dynamo terminals. Make certain that the dynamo is connected correctly, i.e., cable from cut-out and regulator terminal "D" to

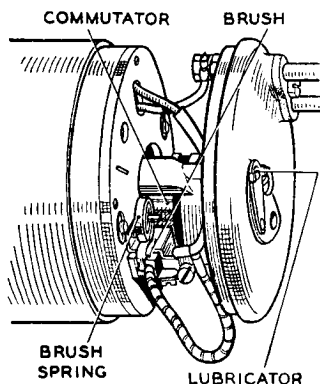


Fig. 18

Finally, screw the nut into its terminal.

99. PICK-UP.

Examine the pick-up or high tension terminal (magneto end).

See that the carbon brush moves freely in its holder, being careful not to stretch the brush spring unduly.

While the pick-up is removed, clean the slip ring track and flanges by holding a soft cloth on the ring while the engine is slowly turned by hand.

100. SPARKING PLUG.

Clean periodically by dismantling and removing all carbon from the electrodes.

Scrape inside of plug body clean of carbon, re-assemble and set gap at .015"—.025".

dynamo terminal "D" and cable from cut-out and regulator terminal "F" to dynamo terminal "F".

102. DYNAMO BRUSHES.

Test if brushes are sticking.

Clean with petrol, and if necessary ease the sides by lightly polishing on a smooth file.

Replace brushes in their original positions.

If the brushes are worn so that the flex is exposed on the running face, new brushes must be fitted.

Brushes are pre-formed so that bedding to the commutator is unnecessary.

A commutator in good condition will be smooth and free from pits or burned spots.

Clean the commutator with a petrol-moistened cloth.

If this is ineffective, carefully polish with a strip of very fine glass paper while rotating the armature.

103. LUBRICATION.

About every 4,000—5,000 miles add a few drops of good quality thin machine oil to the lubricator on the commutator end bracket. The bearing at the driving end is packed with grease which will last until it is necessary for the dynamo to undergo a complete overhaul.

104. CUT-OUT AND REGULATOR UNIT.

This unit (Fig. 19) which is housed beneath the saddle, consists of the cut-out

which is an automatic switch to prevent discharge of the battery when the dynamo is not charging, and the voltage regulator which controls the output of the dynamo. With a fully charged battery the dynamo is only permitted to pass a small charge to the battery, whilst with a fully discharged battery a heavy charge is passed in order to boost up the battery rapidly. Both components are accurately set and should not be tampered with or adjusted.

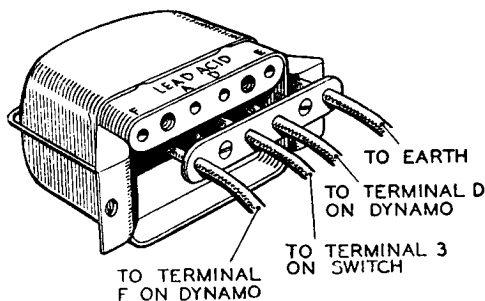


Fig. 19

105. AMMETER.

Fitted in the switch panel of the headlamp, this instrument indicates when current is being taken from the battery in a greater quantity than is being fed to the battery (discharge).

It also shows when the dynamo is charging and hence by means of the regulator the state of charge of the battery (para. 95).

106. BATTERY.

When examining a battery, do not hold naked lights near the vents as there is a danger of igniting the gas coming from the plates.

Remove the vent plugs and see that the ventilating holes in each are quite clear.

Remove any dirt by means of a bent wire.

A clogged vent plug will cause the pressure in the cell to increase, due to gases given off during charging, and this may cause damage.

Make sure that the rubber washer is fitted under each vent plug, otherwise the electrolyte may leak.

Battery—Topping up.

About once a month, remove the battery lid, unscrew the filler caps and pour a small quantity of **distilled** water into each of the cells to bring the acid level with tops of the separators.

Acid must not be added to the battery unless some is accidentally spilled.

Should this happen, the loss must be made good with acid diluted to the same specific gravity as the acid in the cells.

This should be measured by means of a hydrometer.

Checking Battery condition.

The state of charge of the battery should be examined by taking hydrometer readings of the specific gravity of the acid in the cells.

The specific gravity readings and their indications are as follows:—

1.280—1.300. Battery fully charged.

About—1.210. Battery about half discharged.

Below—1.150. Battery fully discharged.

These figures are given assuming the temperature of the acid is about 60 deg. F.

Each reading should be approximately the same.

If one cell gives a reading very different from the rest, it may be that the acid has been spilled or has leaked from this particular cell, or there may be a short circuit between the plates.

This will necessitate its return to a Repair Depot for rectification.

Wipe the top of the battery to remove all dirt or water.

Note.

Do not leave the battery in a discharged condition for any length of time.

If a motor cycle is to be out of use, the battery must first be fully charged, and afterwards given a refreshing charge about every two weeks.

Earthing Connections.

Check that the lead from the negative terminal is securely connected to the cycle frame or other suitable earth.

Charging.

If the previous tests indicate that the battery is merely discharged, and if the acid level is correct, the battery must be recharged from an external supply.

107. HEADLAMP.

Removing Lamp Front and Reflector. (Fig. 20)

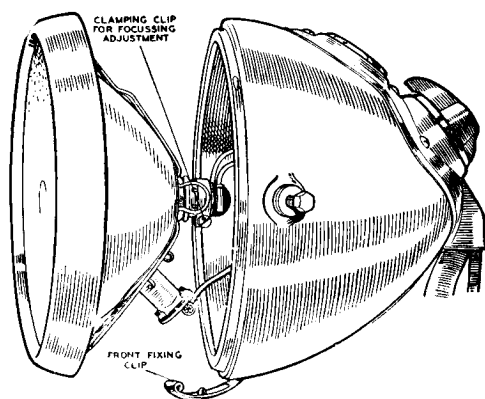
To remove the lamp front and reflector, release the fixing clip at the bottom of the lamp.

When replacing the front, locate the top of the rim first, then press on at the bottom and secure by means of the fixing clip.

To remove the bulb holder, press back the securing springs.

Setting and Focussing.

The lamp must be set to ensure that the main driving beam is projected parallel with the road surface.



VIEW OF HEADLAMP.

Fig. 20

To obtain the best driving light, the bulb should be correctly focussed in the reflector.

To adjust the position of the bulb, remove the front and reflector, and slacken the screw on the clamping clip at the back of the reflector.

Slide the bulb holder backwards or forwards until the best lighting is obtained and finally tighten the clamping screw.

Cleaning.

Care must be taken when handling the reflector to prevent it from becoming finger-marked.

It can, however, be cleaned by polishing with a fine chamois leather.

Metal polishes must **not** be used.

The bulbs should be a 6 volt, 24 watt double filament Lucas No. 70 (main), and a 6 volt, 3 watt S.B.C. (pilot), Lucas No. 200.

108. TAIL LAMP.

The rear portion of this lamp is removable for bulb replacement by giving it a half turn in an anti-clockwise direction, when it will become detached from its fixing.

The correct bulb is a 6 volt, 3 watt S.B.C. Lucas No. 200.

109. CABLES.

Before making any alterations to the wiring or removing the switch from the headlamp, disconnect the positive lead at the battery to avoid the danger of short circuits.

The lead, about 1 foot long, from the positive battery terminal, is connected to the lead from the switch by means of a brass connector.

The connector is insulated by a rubber sleeve, which must be pushed back to allow the connector to be unscrewed.

Do not allow the brass connector to touch any metal part of the engine as this will short circuit the battery.

When connecting up again, pull the rubber sleeve over the connector.

110. LIGHTING SWITCH.

All leads to the headlamp are taken direct to the switch, which, together with the ammeter, is incorporated in a small panel.

The panel can be removed when the three fixing screws are withdrawn.

The ends of all the cables are identified by means of coloured sleeveings.

The colour scheme and the diagram of connections are shown in the wiring diagram.

111. HORN.

Electric horns are adjusted to give their best performance before leaving the works and will give a long period of service without any attention.

If the horn becomes uncertain in action, or does not vibrate, it has not necessarily broken down.

The trouble may be due to a discharged battery or a loose connection, or short circuit in the wiring of the horn.

The performance of the horn may be upset by the fixing bolt working loose, or by the vibration of some part adjacent to the horn.

To check this, remove the horn from its mounting, hold it firmly in the hand by its bracket, and press the push.

If the note is still unsatisfactory, the horn may require adjustment and should be taken to a Lucas Service Station.

RACING MAGNETO, B.T.H.—TYPE K.D.1

112. CONTACT BREAKER.

Contact breaker points should be kept clean, free from oil and adjusted to a gap of approximately .012".

Clean with very fine emery cloth.

Remove by unscrewing the central hexagon headed pin and withdrawing the breaker complete.

Raise and lift to one side the check spring located on the contact lever bush, remove contact lever and clean as necessary.

Before replacing, smear the bush lightly

with thin oil, carefully wiping off any surplus.

113. PICK-UP.

Remove periodically and wipe clean with a petrol moistened cloth.

Insert a corner of clean cloth into the housing so that it bears against the slip ring and flanges, and slowly rotate engine. This will effectively clean the slip ring.

Do not use any means of applying undue pressure to the cloth and ensure that all parts are free of petrol vapour before re-fitting.

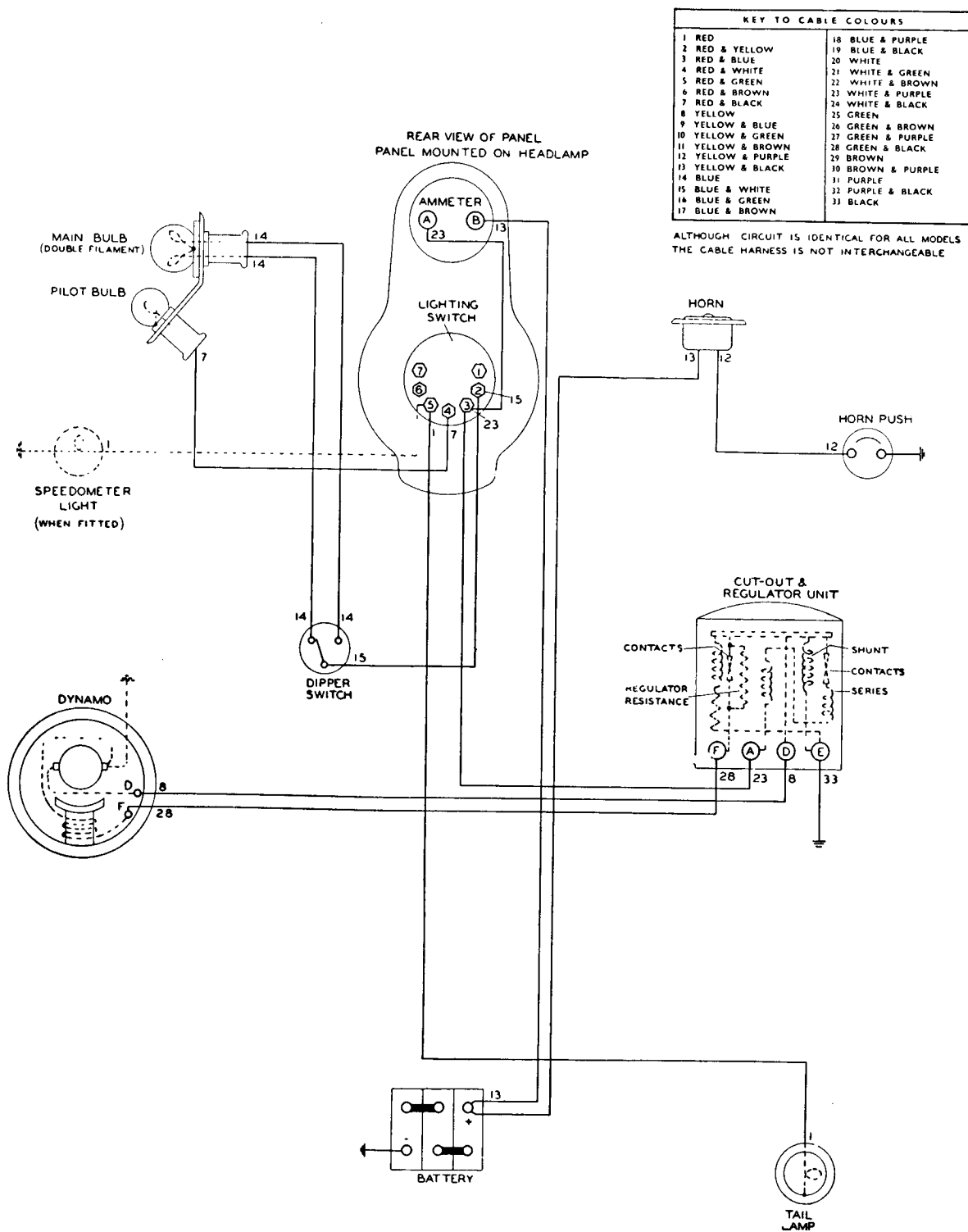


Fig. 21

WIRING DIAGRAM FOR LUCAS MAGDYNO LIGHTING AND HORN EQUIPMENT.

LOCATING AND RECTIFYING POSSIBLE TROUBLES.

TROUBLE.	POSSIBLE CAUSES.	REMEDY.
Failure to Start.	Faulty plug. Faulty H.T. lead. Contact breaker points dirty or out of adjustment.	Remove plug, place plug body in contact with cylinder, revolve engine. If blue spark of fair intensity occurs, plug and ignition O.K.
	Pick-up brush worn or broken. Slip ring oily.	If no spark, change plug, and if still no spark, remove plug from H.T. lead, hold end of lead 1/8" from cylinder and revolve engine. In the event of there being still no spark, examine contact breaker points and check their gap. Examine pick-up brush and clean slip ring.
	Failure of petrol to reach mixing chamber.	Ensure that petrol is flowing down feed pipes. Clean carburetter.
	Broken throttle wire.	Ensure that throttle slide rises as twist grip is revolved.
Erratic Slow Running.	Pilot adjustment requires re-setting.	With throttle about 1/8" open and air closed, adjust pilot screw, until good idling is obtained.
	Worn inlet valve guide.	Remove valve spring and test valve for side play in guide.
	Faulty valve seats.	Examine and re-grind as necessary.
Loss of Power.	No tappet clearance.	Check and re-set as required.
	Exhaust valve lifter holding valve off seat.	Ensure that there is some movement in cable before lever begins to lift valve.
	Front chain too tight.	Adjust.
	Loose carbon wedged on valve seat.	Can usually be removed by kicking engine over a few times.
	Broken piston rings.	Examine and replace as required.
Excessive Oil Consumption.	If accompanied by black smoke from exhaust, broken piston rings, worn rings or barrel.	Examine and make necessary replacements.
	Oil pump not returning.	With engine running an intermittent stream of oil should be seen upon opening oil tank filler cap.
Engine Runs Harshly.	Mag. Chain too tight.	Adjust.
Engine Cuts Out at Large Throttle Openings.	Dirt in carburetter.	Clean and re-adjust.

LOCATING AND RECTIFYING POSSIBLE TROUBLES.

TROUBLE.	POSSIBLE CAUSES.	REMEDY.
Inefficient Brakes. (Front or Rear).	Grease on lining.	Examine and wash in petrol. Do not wash in paraffin.
	Tightness in mechanism.	Make sure that cam is free in its bearing and pedal not binding on spindle due to mud.
Slipping Clutch.	Cable adjusted too tightly.	Re-adjust cable until there is some movement on handle-bar lever before clutch operates.
	Inner cable too long. Clutch worm lever fouling gear box casing.	Shorten and re-adjust.
	Oil on plates (usually caused by overfilling oil bath).	Dismantle clutch plates and wash in petrol.
	Tightness in operating mechanism.	Examine, clean and free off as necessary.
Clutch Hard to Free.	Clutch cable adjuster screwed right out, clutch worm lever not at correct angle and therefore not having a straight pull.	Re-set clutch worm lever to give straight pull. Shorten inner cable and re-adjust.
Failure to Effect Gear-Changing.	Gearbox control rod out of adjustment. Over revving especially from 1st to 2nd.	Re-set as instructed in para. 53.
Gear-Changing Accompanied by Excessive Noise.	Slack rear chain.	Adjust as necessary.
Footchange Lever hard to Operate.	Footchange requires greasing.	Nipple on indicator retaining screw.
Failure of Footchange Lever to Return to Normal Position.	Broken hairpin return spring.	Remove positive mechanism cover and front plate. Examine spring, renew as required.
Steering Rolls or Wanders.	Loose head adjustment.	
Twist Grip Closes if Released.	Tension requires adjusting.	Screw in adjuster one or two turns.
Steering appears Tight on Corners.	Steering damper binding, caused by bent frame anchor bracket.	Remove anchor bracket and re-set to correct angle.