No. 697.

WORKING INSTRUCTIONS

for

"PIONEER"

Motor Road Rollers.

BARFORD & PERKINS LTD.,
PETERBOROUGH,
England.

Telegrams : "Barfords, Peterborough." Telephone : Peterborough { 28 & 479.
Codes : Bentley's ; A.B.C. 5th & 6th Edition.

1926 EDITION.

Printed in England.

INTRODUCTION.

THIS little booklet has been written to assist the drivers in the care and upkeep of our Motor Rollers.

We build what we believe to be the best rollers on the market, and although all parts are of sufficient strength and wearing properties to perform their respective work, every machine amply repays care and attention.

If there is any point on which you desire further information please do not hesitate to write us. Our interest in our rollers does not cease when they are bought and we shall at all times be very pleased to hear from you.

BARFORD & PERKINS, LTD.

MOTOR ROAD ROLLERS.

GENERAL INSTRUCTIONS.

PRELIMINARY.

Keep the Roller clean. This should be done regularly as it will keep all parts at their best working point. Appearance of the machine also reflects on the operator. Make a careful examination of the machine every day. It is to your interest as well as your employer's to have an efficient Roller giving the least amount of trouble, ready for service when required, and reliable in working. To this end it is necessary that an inspection of the machine should be made daily—preferably before starting work—to make sure that all adjustments are correct, nuts tight, sufficient water in radiator, and the proper quantity of oil in engine, etc. Do this every day systematically, it is time well spent.

KNOCKING.

Should a knock develop in the engine it is most essential that an investigation be made at once to ascertain the cause. If it is not attended to immediately, serious results will follow, involving a heavy repair bill.

MISFIRING.

Do not continue to work Roller if the engine fires on only two or three cylinders. Trace the cause and remedy it. Usually, cleaning the sparking plugs will put matters right.

Do not under any consideration race the engine. It is very harmful and must at all times be avoided. The correct Engine speed is 1000 RPM (except in the case of the B.B. Engine 1100—1200 RPM). Reduce engine speed, when standing, by closing throttle. By doing this you not only save fuel, but reduce wear and tear to a minimum. **Very often rolling can be done in Top Gear with Engine throttled down to 600 or 700 RPM, which also results in economy in fuel.** Never run the engine for any length of time with clutch disengaged and gears in mesh. It is much better to move gear lever to NEUTRAL and engage clutch. This will eliminate any chance of Roller being put in motion unexpectedly and prevents wear of the clutch collar.

PREPARING THE ROLLER FOR WORK.

(This applies more particularly when the roller is first received, but certain points apply when starting up the roller for its daily work.)

A new machine requires careful attention before starting up, and should be used with special care until all working parts are thoroughly run in. This will lead to satisfactory working and long life.

EXPORT.

When the Roller is despatched from works, all water, fuel and oil is drained off from the engine and tanks ; it will therefore be necessary to refill the machine with these essentials.

After unpacking, clean off all dirt, grease, etc., and see that all working parts are free from grit which may have accumulated in transit.

Remove Contact Breaker from Magneto and clean off all grease.

HOME.

Only water and fuel are drained off from engine.

GENERAL—LUBRICATION, ETC.

See that all oil ways and oil holes are clear, and that all working parts receive a liberal supply of clean oil.

Fill all grease cups with a good quality grease and give 1 or 2 turns, and all oil cups and lubricators with good oil.

Fill the petrol and paraffin tanks.

Fill the radiator with soft water. See page 7.

See that engine crankcase (or mechanical lubricator on type AN engine) contains the necessary amount of lubricating oil (see also particular instructions for type of engine pages 18, 24 and 32), and that gearbox contains the correct amount of oil and grease.

It is most important that perfect lubrication should be maintained in all moving parts of the engine. Use only the best quality oil (see "Lubrication" under various engines, pages 18, 24 and 32). Engine trouble is often wrongly attributed to faulty design or workmanship when it is actually caused by neglected lubrication,

or the use of dirty or poor quality oil. The engine oil (unless type AN Mechanical Lubricator is fitted) should be renewed every 500 working hours. Take great care to keep your oil free from water and dirt. Wipe round the mouth of container before commencing to pour in the oil and always use a strainer when adding oil.

Driving Chain :—The driving chain should not be lubricated externally, as oil or grease applied to the outside only collects dust. Every three months (according to the amount of work done) the chain should be removed, soaked in paraffin to remove dirt, hung up to drain, and afterwards soaked in hot molten grease. A chain adjusting device is fitted to all rollers with which it is quite easy to tighten the chain. A droop of the top side when slack of 1½ ins. from the horizontal should be allowed.

Brakes :—Keep brake drums on metal to metal brakes slightly oily.

Sparking Plugs :—Use a suitable type of sparking plug. The plug found after careful tests to give the most satisfactory all round results is the Model C3 Lodge (3 point) which is suitable for all our types of engines.

USEFUL INFORMATION.

All fuel should be strained to prevent water or dirt from passing into the tanks. Carelessness in this direction is liable to cause trouble due to obstructions in the pipe lines. There is a filter in fuel system—drain any foreign matter from the pipes by opening the tap at bottom of the filter chamber occasionally, also the filter gauze should be removed and cleaned out frequently.

See that the small vent hole in each filler cap is not choked up—this would prevent a proper flow of fuel to the carburetter. When filling tanks be sure there is no naked flame near. Always fill tanks in the open, petrol vapour is heavy and remains near the floor of closed buildings.

Use good clean soft water for the radiator. Water taken from ponds, rivers or a similar source must be carefully strained to prevent dirt getting into the radiator. The dirt collects on the radiator tubes and causes inefficient cooling.

Drain off all water from the Radiator, Cylinder Block and Water Pump during frosty weather, when machine is not in use. Cocks or plugs are provided in Cylinder Water Jacket, Radiator and Pump for this purpose. (Pump is fitted on type RO Engines only.)

Do not forget to fill the radiator with water before starting the engine again.

In severe frosts the rollers should also be emptied.

Do not pour cold water into an over-heated engine. If the water level has been allowed to get too low always wait until the cylinders have cooled down, otherwise there is risk of cracking them.

Always bring gear levers into the *neutral position* when stopping the roller (but not the engine), and see also that *gears are in neutral before attempting to start the engine.*

When cranking the engine always pull up against compression. Never attempt to crank downwards, and stand clear of the starting handle at all times. It is sometimes advantageous to

turn the engine over 2 or 3 times with the switch "off" and the throttle slightly open to fill the cylinders with petrol vapour, before attempting to start. (This should only be necessary when engine is cold or when machine has been idle for some time.)

Type RO Engines only :—When the radiator is apparently full give the engine a few turns by hand ; this causes the circulating pump to fill water jackets around cylinders and cylinder head. Then fill up the radiator again ; when completely full, water will escape from the overflow pipe at the bottom of the radiator.

CHANGING OVER FROM PETROL TO PARAFFIN.

Run the engine on petrol for about 5 minutes to get the vapouriser thoroughly warmed up before changing over to paraffin. Before changing over to paraffin, do not be afraid of running fast enough to get engine well hot. Do not leave roller standing and engine running slowly on paraffin as it will soon choke up. Change over to petrol again a few minutes before shutting down, so as to clear the float chamber of paraffin, and ensure a supply of petrol when engine requires to be started again.

Carburetter :—The Zenith carburetter is fitted to all models and the settings are carefully adjusted to a definite standard on test before leaving the works. These settings have been found by experiment to give the best results for both power and economical running. It is of the utmost importance that they should not be altered except on the recommendation of the makers or demonstrator.

For full particulars see Carburetter Book supplied with each roller.

Jets :—Should the jets at any time become choked up, wash them in petrol and if necessary clear with a very thin copper wire or a brush bristle (a cleaning wire as supplied for Primus Stoves will be found useful). On no account use a reamer or anything which is likely to increase the size of the jet. When replacing the jets see that the fibre washer is in position on its collar, and screw them up tightly with the jet spanner.

The correct method to adjust the pilot jet is to screw it down tightly and then unscrew ¼ of a turn until the most suitable setting for the engine is found. If the engine still fails to run slowly the small hole in the jet is choked up and requires cleaning (see preceding paragraph).

Clutch :—The clutch (or clutches " Q " series) should be kept carefully adjusted, the spring pressure being sufficient to drive the roller without slip when the clutch is fully engaged. Too much spring pressure will cause the clutch to engage fiercely, and the machine will start away with a jerk, which is detrimental to the working of the roller. Always let in the clutch as lightly as possible, and keep the foot off the pedal when working, otherwise slip and wear takes place. See page 27 for " Q " series.

TO START THE ENGINE.

25 HP ENGINE ONLY.

Important. When starting the type AN engine, turn the handle of the mechanical lubricator for about 5 minutes to get oil to all bearings, big ends and cylinders, also pour about a pint of oil in

engine governor case through front cap to lubricate the governor. Turn the engine over quickly for a minute or two with the ignition switch off.

The above applies when roller is first received or when it has been out of use for a long period, but always before starting give lubricator handle three turns.

ALL ENGINES.

(1). Retard Ignition if not Impulse (Ignition should be advanced as soon as engine is started).

(2). Close the fuel cock and drain off car buretter float chamber and filter in case they are full of paraffin (kerosene). This is not necessary if only petrol or benzol is used, or if care is taken to turn on petrol for a few minutes before shutting down.

(3). Turn three-way cock to admit petrol or benzol (Paraffin engines only).

(4). Flood carburetter by holding up needle valve (type RO engines excepted).

(5). Slightly open throttle by hand lever (the best position for starting will soon be found by experience), pull out air strangler (B.B. Engine only), engage starting handle by pushing in towards engine, and after a preliminary turn or two with the switch " off ", to charge the cylinders, a sharp pull up with switch on, will start the engine.

Do not open throttle suddenly when the engine is cold, very gradual openings should be made until the engine is thoroughly warmed up.

Run with the ignition as far advanced as possible. The engine will then run cooler and the petrol consumption will be lower.

Check the setting of the electrodes of the sparking plugs frequently. These should be about .020 ins. apart. Examination of the sparking plugs will give a good idea of the general conditions under which the engine is working. If the engine is running too rich or is using too much lubricating oil, the sparking plugs will be sooty.

Check compression of each cylinder occasionally.

Check also the firing of each cylinder at the compression cock to see that each one does a fair share of work.

An Impulse Starting device is fitted on the 25 and 36 HP engines, but not on the type B.B. engine

When the engine is started, adjust throttle and ignition levers so that engine runs slowly for about 10 minutes.

NOTE.—With the throttle lever fully open the engine is controlled by a governor, which is fitted on all models.

SEE THAT :—

Engine is not misfiring.

Lubricating system is in order and working.

Water circulating system is in order and working.

ENGINE TROUBLES AND REMEDIES.

Failure to Start :—

Magneto switch in "off" position.

Fuel not turned on.

Paraffin turned on instead of petrol :—
Turn off paraffin at tank, drain off carburetter and fuel pipes and turn on petrol.

Short circuit on Magneto switch or switch wire :—
Disconnect switch wire from magneto (repair or replace defective part).

Stoppage in fuel pipe, filter, float chamber (needle valve) or jet caused by dirt or water in fuel :—

Sparking plug points touching :—

Sparking plug points too far apart :—
Set to correct gap (approx. 1/64 of an inch) to gauge supplied.

Sparking plug porcelain cracked or broken :—
Replace defective plug or plugs.

Sparking plug points dirty or oily :—
Dismantle plugs, scrape off carbon deposit from inside of body and wash in petrol.

Contact breaker rocker arm stuck :—
Ease fibre bush with fine emery wrapped round a match.

Platinum points not separating to the correct gap :—
Adjust to gauge on magneto spanner.

Carbon dust in distributor accumulated from brush wear causing short circuit :—
Wipe with a clean cloth dipped in petrol.

Broken carbon brush :—

Faulty or perished high tension cable insulation :—

High tension cable broken inside insulation :—
Replace.

Engine Chokes :—

Turn off petrol, open compression taps, turn engine several times with switch off.

Misfiring :—

Mixture too rich :—

Carburetter Flooding. Bent Needle Valve. Dirt between needle valve and seat.
Examine for punctured carburetter float.
See that gauze over air intake (36 H.P. engine only) is not choked with dust.

Mixture too weak :—

Examine for air leaks at carburetter and inlet manifold flanges, replace any defective copper asbestos washers. Examine valve stems and guides, replace any that are badly worn.

Partial obstruction of petrol pipe or carburetter :—

Loose terminals or faulty high tension cable :—

Sparking plug points dirty or oily :—

Platinum points incorrectly adjusted or oily :—

Proceed as for failure to start.

Valve or Valves not seating :—

Adjust valve tappets, examine valves for bent stem, clean carbon from stem.

Broken valve spring :—

Replace.

Poor compression :—

Valves require grinding in or worn piston rings require replacing.

Water in fuel :—

Air vent in Tank filler cap stopped up :—

Loss of Power.

Poor compression :—

Proceed as for misfiring.

Incorrect clearance between valve stem and tappets :—

Set to clearance given in engine instructions.

Weak valve springs :—

Replace.

Piston and Combustion chamber heavily coated with carbon :—

Remove cylinder head and scrape away carbon deposit from head and pistons.

Valves sticking in guides :—

Examine for bent valve stems, clean carbon off stems.

Exhaust pipe or silencer (or both) choked with carbon.

Dismantle and remove carbon deposit.

Unsuitable sparking plugs causing pre-ignition :—

Replace with plugs as recommended for the engine.

Engine Will Run Slowly *but will not accelerate when throttle is opened (see under loss of power).*

If the above causes have been investigated and failed, see if Induction pipe through Vapouriser is choked with Carbon deposit.

GEAR CHANGING.

See special instructions for "Q" series. Only one lever is fitted on the "A" series for both changing speed and reversing. Before attempting to move the change speed or reversing lever depress the clutch pedal to its fullest extent, wait a second or two until the clutch cone and the

parts attached to it come to rest, then pull the gear lever into the required position. Should the gears fail to engage do not attempt to force them, but return the lever to the neutral position, engage the clutch again slightly and proceed as before. The time taken for the rotating clutch parts to stop, when the clutch pedal is depressed, depends on the adjustment of the clutch brake (fitted on all rollers except A, C and Q series), and after a little experience gear changing should present no difficulties to the driver.

PERIODICAL ATTENTIONS—DAILY (before commencing work).

(1). Examine water in Radiator and fill up as required.

(2). Examine oil level in Engine and fill up to proper level if necessary. If roller is fitted with type AN Engine see that the Mechanical Lubricator is full.

(3). Examine fuel in tanks—fill up if required, and see that sufficient fuel is carried for the day's work.

(4). Fill up all oil and grease cups and give all grease cups one complete turn. If roller is fitted with type AN Engine give Mechanical Lubricator 3 complete turns before starting engine and drain surplus oil from crankcase.

(5). Run engine slowly for a few minutes and see that it is not misfiring, that lubricating system is functioning correctly, and water circulating system is in order and working.

WEEKLY.

(1). Give roller a thorough clean down and *tighten up any loose bolts.*

(2). Adjust brakes and see that they are in good working order. Oil all pins and working joints.

(3). Locate any fuel, oil, or water leaks and attend to them.

(4). Oil Front Rollers (give each about $\frac{1}{4}$ pt.)

(5). Adjust valve tappets if necessary.

(6). Adjust Fan belt if necessary.

(7). Remove and clean oil strainer in engine. (This does not apply to 25 H.P. type AN Engines as no oil is carried in sump).

MONTHLY.

(1). Thoroughly examine all mechanical parts and see that no rivets in the frame are loose.
Do not try to tighten loose rivets by hammering, cut them out and replace with bolts.
Tighten up any loose bolts, and see that no springs are broken, look out for approaching troubles and forestall them.

(2). Examine grease in Gear Box—do not put too much in ; as long as Gear Wheel nearest to bottom of the Box is dipping in well it is quite sufficient. Use a mixture of oil and grease, mixed to a creamy nature.

(3). Clean Petrol and Paraffin Filter.

(4). Oil and grease Steering Gear.

(5). Give a few drops of oil to each lubricator on Magneto and clean contact breaker and brushes.

(6). Remove all syphon wicks from oil boxes and wash in paraffin.

(7). Adjust Driving Chain if necessary.

GENERAL UPKEEP.

(1). About every 6 to 8 weeks drain oil from Engine sump and wash out with paraffin (taking care that all paraffin is drained off before refilling with oil). Clean oil strainer and recharge sump with the necessary amount and grade of oil as recommended in the Engine instructions (not necessary on type AN Engines as no oil is carried in sump).

(2). Every 6 months grind in valves with fine emery powder taking care that all traces of emery are removed when finished. Adjust tappets after grinding in valves (refer to engine instructions for clearances).

(3). Decarbonize cylinders and pistons about twice a year.

(4). Keep the outside of the engine clean. When cleaning the engine various detail defects may be discovered before they have a chance to become serious.

A GOOD DRIVER.

Is never flurried.
Does not keep his feet on clutch or brake pedal.
Has small bills for fuel and repairs.
Always keeps his machine clean.
Changes gear quietly.

RUNNING INSTRUCTIONS FOR TYPES TH-B, TWJ & TWK MOTOR ROLLERS FITTED WITH 36 H.P. 4 CYLINDER ENGINES.

Type RO.

ENGINE.

4 cyl. 4¾ins. x 5½ins. stroke.

	BHP	RPM	Cubic capacity.
On petrol	36.	1000	6387 c.c.
On Paraffin	36.	,,	,,

LUBRICATION.

The oil found most suitable for the type RO Engine is Vacuum A, Double Shell Motor Oil or corresponding Price Oil (Vacuum B.B. or Triple Shell Motor Oil for Tropical Countries). Three gallons of oil must be put into the engine crankcase when the roller is received or after crankcase has been drained off, and care taken to keep the oil at the correct level by making up wastage daily. See Oil Level Rod at the side of the crankcase.

The oil pressure should be maintained between 15 and 20 lbs. per sq. inch when engine is warmed up and is indicated by a pressure gauge in front of driver. Stop and investigate if pressure falls to zero.

The probable causes are :—Insufficient oil. Choked oil strainer. Loose pipe joint. Dirt between relief valve and seat (this also applies to B.B. Engines).

The remedies are obvious, and the engine should on no account be run until the defect has been rectified.

In order to maintain the oil in the crankcase up to a reasonable standard, it is advisable to draw off at frequent intervals half a gallon of the used oil and replace it by an equal quantity of fresh oil.

When starting up in cold weather the pressure will rise above normal, but this will not cause trouble, and is due to the oil being much thicker at low temperatures.

The oil pressure can be regulated by adjustment of oil relief valve spring. No alteration to the adjustment of this spring should be made unless it has been proved by examination that the oil supply is insufficient, the filter clean, and the lubricating system in good order. Also the adjustment should not be set until the engine has run for a few minutes and the oil has reached normal temperature

As previously pointed out, when starting up in cold weather, the oil pressure will be higher, but no alteration to the relief valve adjustment must be made, as the pressure will return to normal as the oil becomes warm.

VALVES AND VALVE SETTING.

The correct clearance between bolt head and end of valve stem should be 1/32nd of an inch for inlet and exhaust valve, measured when the engine is hot. This measurement should be made for each valve when the valve has returned to its seat and the engine has been given a half turn.

The clearances should always be tested whenever the cylinder head has been removed and after the valves have been re-ground. It is advisable to check again the clearances after working for a few hours when valves have been re-ground.

The timing gearwheels situated at the front end of Engine Column are marked on the teeth after Engine is correctly timed at the Works. Should these wheels be removed or disturbed for any reason, carefully match the markings one wheel

with the other when replacing. The valve timing will then be as originally set. The slightest deviation from this setting would cause irregular running of the Engine and in extreme cases will result in the Engine refusing to function properly. Therefore exercise the greatest care in assembling.

CARBURETTER.

An important feature of the type RO Engine is the Ricardo Patented Paraffin Carburetter in which is also incorporated the well known Zenith patents.

The sizes of the jets and choke tubes usually giving the best results on different fuels are :—

Fuel.	Main Jet.	Compensating Jet.	Choke.
Petrol	130 c/c	120 c/c	22
Petrol—Main jet can be reduced to		115 *c/c for level country.*	
Benzol	120 c/c	110 c/c	22
Paraffin	130 c/c	120 c/c	22

As extreme climatic conditions affect starting and running, these sizes may all be increased in very cold weather and decreased in very hot weather and may require modification in high altitudes.

MAGNETO AND IGNITION.

These instructions apply also to the types AN and BB engines (except where marked on pages 26 and 34).

The Ignition is by Simms High Tension Magneto, with which is incorporated an Impulse Starter. This fitment is arranged to ensure a very hot spark for the starting impulse, irrespective of how quickly the engine is cranked.

The magneto is coupled to the driving member by a Simms Patent Vernier Coupling, by which it is possible to time the magneto within very fine limits.

The contact breaker should be set to break at full retard when the piston is on the top dead centre of the firing stroke. The firing order of the type RO engine is 1,3,4,2. No. 1 Cylinder being the one nearest the Radiator.

For Timing Instructions, etc., see Magneto Book S.R.4 supplied with each roller.

GENERAL INSTRUCTIONS FOR THE MAGNETO.

Keep contact breaker properly adjusted. The correct gap is 0.4 m/m and should be set to gauge on magneto spanner.

On no account allow any oil to find its way on to the platinum contacts.

Keep distributor free from accumulations of carbon dust.

It may happen occasionally that the bell crank lever sticks owing to the swelling of the fibre bush, but by slightly easing the bore with fine emery wrapped round a match this trouble is easily remedied.

Keep the sparking plugs clean and free from oil and carbon deposit.

See that the points are correctly set. The correct gap is approximately 1/64 of an inch.

Full instructions on the care of the Simm's Magneto, are given in the Magneto booklet sent out with every Roller.

CLUTCH.

The clutch fitted to the type RO Engine is of the simple cone type (Ferodo lined), easily accessible, adjustable for wear and fitted with an adjustable clutch stop to facilitate gear changing.

FIERCE CLUTCH (This also applies to B.B. Engines).

A fierce clutch may be due to excessive spring pressure, or to the fact that the Ferodo Lining has become dry and clogged with dirt; either case demands immediate attention. The remedy in the first case is obvious, and in the second the trouble can be rectified by thoroughly washing the Ferodo Lining with paraffin. This may be conveniently done by withdrawing the clutch cone to its full extent and pouring or squirting paraffin over the clutch lining. (This must be done with the engine running very slowly). The clutch should now be engaged and disengaged by means of the foot lever, at the same time allowing slip to take place between the clutch cone and flywheel. Repeat several times to effectively clean the clutch lining. No further dressing should then be necessary.

SLIPPING CLUTCH.

Clutch slip may usually be traced to the lining becoming saturated with oil or grease and a dressing of powdered Fullers' earth will generally overcome the trouble. If this is not effective the cause will probably be traced to the Ferodo Lining having worn thin, allowing the rivet heads to come into contact with the flywheel. The remedy is to dismantle the clutch and fit a new lining.

Insufficient spring pressure is another cause of slip, and must be adjusted occasionally as the clutch lining seats deeper in the flywheel.

GEARBOX AND GEARING.

All gears are totally enclosed and run in oil, except the chain drive, which is covered by a sheet metal guard.

CHANGE SPEED BOX.

The gear case should be partly filled with a mixture of good quality gear grease and thick machinery oil. About 23 lbs. of grease to 3 galls. of oil are required if gear box is empty. As this mixture thins with work it should be made up with grease only.

REDUCING GEAR BOX (TWJ & TWK only).

Fill to level of top test cock with good thick machinery *oil only*. Test level occasionally (by opening bottom test cock) and make up wastage as required.

DRIVING CHAIN.

(See under heading " Preparing the roller for work " on page 6.)

RUNNING INSTRUCTIONS FOR TYPES D3, D4, EW, E5, E6, F8, FS8, Q6, Q7, Q8, and TH MOTOR ROLLERS FITTED WITH 4-CYL. 20 & 25 H.P. ENGINES.

Type AN.

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4 Cyl. Engine.			Cubic cap.
*3½" bore x 5" stroke.	BHP on petrol 20.	RPM 1000	3152 c.c.
	BHP on paraffin 16.	,, 1000	,,
3⅝" ,, x 5" ,,	BHP on petrol 25.	,, 1000	3858 c.c.
	BHP on paraffin 20.	,, 1000	,,

* Used on a few D3, D4 & Q type rollers, now superseded by 3⅝" bore engine on all above types.

LUBRICATION.

The most suitable oil for the type AN Engine is Vacuum A, ~~or Vacuum BB for tropical countries~~ (see page 18 for equivalents) with which the lubricator box must be filled, capacity about 9 pints.

The Lubricator is a mechanical one, and separate pipes lead to each cylinder for the lubricat on of the cylinders, pistons and gudgeon pins. A pipe goes to each of the three main bearings. A pipe also goes to each of the four big ends, and the remaining one lubricates the magneto spindle, timing gear and governor gear in front of engine. The oil feed to the big ends is caught in rings fixed to the crank shaft webs, and centrifugal action forces this oil into the drilled crank pins The lubrication of the big end bushes is thus effected.

After the engine has been in use for two months, the lubricator may be adjusted from maximum to minimum supply when all parts of the engine mechanism will receive an ample supply of oil. On only very exceptional cases of heavy

work should the maximum supply ever be necessary. No oil is necessary in the crankcase, as no part of the engine depends upon " splash " lubrication. Any oil which collects in the crankcase should be drained off daily by means of the drain cock. Keep this drain cock closed at other times to exclude dust.

Always give the Lubricator Handle 3 complete turns before starting. (See also " To start engine " section, page 9.)

VALVE AND VALVE SETTING.

The correct clearance between valve stem and valve tappet is between .003 to .007 of an inch for both inlet and exhaust valves.

The timing gears situated at the starting handle end of engine are carefully marked at the works. Should it be necessary at any time to remove the wheels, carefully match the markings and the valve timing will be as originally set.

CARBURETTER.

The carburetter fitted is a modified Zenith and the most suitable sizes of jets and choke for different fuels are :—

Fuel.	Main Jet.	Compensating Jet.	Choke.
Petrol	100	105	22
Paraffin	95	105	21

As extreme climatic conditions affect starting and running, these sizes may all be increased in very cold weather and decreased in very hot weather, and may require modification in high altitude.

MAGNETO AND IGNITION.

Same instructions as for type RO Engine (see page 20).

The Firing order is 1, 3, 4, 2, No. 1 cylinder being the one nearest the Radiator (except on "Q" series when it is the one furthest from Radiator). For Timing Instructions, etc., see Magneto Book S.F.4 supplied with each roller.

CLUTCH.

The clutch fitted to the D3, D4, EW, E5, E6, F8, FS8 and TH types is of the single dry plate type easily adjustable and fitted with clutch stop.

Special plate clutches are fitted to "Q" series, see page 27.

GEAR BOX AND GEARING.

CHANGE SPEED BOX.

A mixture of good quality grease such as Gargoyle Mobilubricant and thick machinery oil (used engine oil will do ; this applies to *type AN engines only*, as oil is used once only) in about equal parts by weight should be used in the gear box, sufficient being put in to keep the lowest gear in the box dipping to a depth of about 2 inches.

Make up wastage from time to time as mixture thins with work by adding grease only.

GEARING.

The teeth of the outside gears should be occasionally well coated with vaseline, gear grease or graphite grease.

DRIVING CHAIN.

(See under heading "Preparing the roller for work" on page 6).

SPECIAL FEATURES APPLYING TO THE "Q" SERIES ONLY.

The engine is exactly the same as employed on the D, E, F and TH Series, and the same general notes apply in both cases.

CLUTCHES.

The reversing is accomplished by two foot operated clutches of the dry dual plate type with Ferodo linings, enclosed in the Gear Box.

These are easily adjustable for both spring pressure and wear.

ADJUSTMENT OF CLUTCHES (FOR WEAR).

To adjust for wear the smaller cover on gear box must be removed, the forward or reverse clutch placed into engagement, and the small adjusting screws (3 for each clutch) on the operating levers screwed in, care being taken that the plungers are equally adjusted on each clutch. This can be checked by watching the relative positions of the grooves turned in the plungers for this purpose. The mark on the toggle disc should coincide with the left hand edge of the projections on the indicator plate (on outside of gearbox) when the adjustment is correct with either clutch in engagement. Unequal or too much adjustment of the plungers will cause overheating of that particular clutch when *running free*. This should be rectified at once. A small re-adjustment will correct the trouble.

ADJUSTMENT OF CLUTCHES (SPRING PRESSURE).

To adjust the spring pressure, the lock nut on the external spring plunger must be slacked back and the spring plunger screwed in to increase the load, and outwards to reduce it. The whole operation of adjusting the clutches occupies a few minutes only.

REVERSING.

With a foot on each pedal it is only necessary to exert a pressure on one or the other of the pedals (these are clearly marked " F " for forward and " R " for reverse) and steady the rising pedal with the other foot. When the pedal has been pushed over, it should be allowed to complete its motion steadily under the action of the spring. No extra pressure should be exerted by the feet when the clutches are engaged, as the spring is proportioned to give the correct loading.

CHANGING GEAR.

The forward and reverse pedals should be brought into the midway position, when the clutches will be disengaged. Slightly depress the pedals alternately once or twice (about 1in. of movement on either side of the neutral position is usually sufficient) to allow the clutch plates to free themselves and the rotating parts to slow down, then push the gear lever into the desired notch, still holding either of the pedals slightly depressed. Do not use force if the gears fail to engage, but engage one or other of the clutches momentarily then proceed as before.

An occasional coating of vaseline or gear grease is all that is necessary to keep the outside gears in good condition.

POWER STEERING GEAR.

A simple and efficient power steering gear is provided which is driven from the clutch spindle by a roller chain. Two small cone clutches operating in conjunction with a bevel gear give the necessary forward and reverse motions.

The drive is transmitted by 1 in. pitch roller chain to the steering handwheel spindle and operates from this point through the standard steering arrangement.

The steering is controlled by a hand lever conveniently placed at the right hand side of the driver, the lever being moved in the direction it is required to turn, therefore there is no possibility of mistake or confusion in steering. A hand steering wheel is also fitted which can be used independently of the power steering, without any disconnecting whatever. A safety device is provided which automatically throws out the power steering gear if the rollers are locked round beyond a safe angle.

The smaller chain while being sufficiently strong to meet all ordinary steering requirements, is purposely of light section to limit the power that may be transmitted to the steering gear, as the chain is directly connected to the clutch driving spindle, which is positively driven from the engine.

In the event of misuse or accident, this chain will break and act as a safety device and prevent damage to the more expensive parts of the gear. Care should always be taken when operating the power steering gear, especially with the machine stationary on very soft ground, not to apply an excessive pressure on the hand lever, as with the clutches properly adjusted a light pressure only is

necessary. Always withdraw lever gently, otherwise if the lever is jerked the opposite clutch may be suddenly engaged and the chain broken. With reasonable handling the power steering gear will give no trouble.

ADJUSTMENT OF THE POWER STEERING CHAINS.

Adjustment of the small driving chain between clutch spindle and layshaft is provided by the Phosphor Bronze eccentric bush carried in the layshaft bracket. This bracket is on the off side of the front cross plate. It is only necessary to slack off the clamping bolt, insert a tommy bar in one of the holes in the bush, and rotate the bush gradually until the chain is correctly tensioned, when the clamping bolt must be tightened up again.

The larger chain between the bevel gear box and the handwheel spindle is adjusted by slacking off the four nuts which secure the box to the front cross plate, through which the spindle carrying the small chain sprocket projects. The bevel gearbox will then be free and may be moved bodily upwards or downwards within the limits of the slotted holes, until the correct chain tension is obtained. When the limits of adjustment have been reached a link can be removed from either of the chains.

The chains themselves require very little attention, an occasional soaking in paraffin and immersion in a bath of molten grease is all that is necessary.

POWER STEERING CLUTCHES AND CLUTCH ADJUSTMENT.

The clutches are of the simple metal to metal cone type, operated by a declutching bar running across the face of the bevel gear box, and held in the neutral position by two compression springs.

At each end of the bar a withdrawal ring (with ball thrust washer) is clamped by two nuts, by which all the necessary adjustments are carried out. To adjust for wear the inner nuts must be slacked off and the outer nut tightened up against the withdrawal rings. A slipping clutch usually indicates that adjustment is necessary. The lever in the extreme positions should always be clear of the end of the slot in the Direction Plate otherwise the clutches are prevented from being fully engaged.

LUBRICATION.

The bevel gear box should be kept about 1/3 full of a mixture of oil and grease. The splined sleeves on which the clutch cones slide should be oiled daily. The grease lubricators on the withdrawal rings require a turn or two every four hours, and a spot of oil should be occasionally put on the clutch cones to prevent seizing.

If either of the clutches seize, switch off engine immediately. No trouble should be experienced when the clutches have become properly bedded in, but when the roller is new it may happen.

RUNNING INSTRUCTIONS FOR TYPES A, A2, A3, A4, A4-Q & C4 MOTOR ROLLERS FITTED WITH 4 CYL. 11—12 H.P. ENGINES, Type BB.

ENGINES.

4 Cyl. $2\frac{9}{16}$" bore x $4\frac{5}{16}$" stroke.

BHP on Petrol.	Cubic Capacity.
11 at 1100 RPM (A series)	1498 c.c.
12 at 1200 RPM (C4 series)	1498 c.c.

LUBRICATION.

The oil recommended for the Type BB Engine is "Vacuum A," or Vacuum B.B. for Tropical Countries (see page 16 for equivalents). The quantity of oil required may be determined by testing with the oil level rod in crankcase when the engine is at rest. It is advisable after replenishing to run the engine for a minute or so, and again check the oil level in the sump, as a considerable quantity is required to fill up the lubricating system. An oil pressure indicator is fitted in such a position that the driver can see at a glance if the oiling system is working satisfactorily.

In order to maintain the oil in the crankcase up to a reasonable standard, it is advisable to draw off at frequent intervals about a quart of the used oil and replace it by an equal quantity of fresh oil.

In cold weather the oil indicator may not always register when the engine is started from cold, due to the oil being much thicker at low temperatures. To prevent any risk of seizure, the engine after

running for a few minutes, should be switched off, and allowed to stand for a short time. The heat generated by the engine will thin the oil in the pipes and sump, and on starting up again, no further trouble is likely to be experienced (see page 18 for other probable causes of oil pressure failure).

VALVES AND VALVE SETTING.

The clearance between the tappets and valve stems should not be less than .004 of an inch and not more than .008 of an inch, for both inlet and exhaust valves. The timing gear at the starting handle end of engine is driven by a roller chain. Should it be necessary at any time to disturb the valve setting it is so arranged that if the exhaust valves are set to close at 6° (this is equivalent to .81 ins. measured on the periphery of the flywheel for A series and .87 ins. for C4) after top centre, the settings of the inlet valves are automatically corrected.

CARBURETTER.

A Zenith Carburetter is fitted, the most suitable sizes of jets and chokes for different fuels are :—

Fuel.	Main Jet.	Compensating Jet.	Choke.
(A, A2 and A3 only).			
Petrol	80	80	17
(A4, A4-Q and C4 only).			
Petrol	85	85	17

As extreme climatic conditions affect starting and running, these sizes may all be increased in very cold weather and decreased in very hot weather and may require modification in high altitudes.

MAGNETO AND IGNITION.

The same general notes as for the types RO and AN engines apply in this case also (see page 20) except that no impulse starter or Vernier coupling is fitted.

The firing order is 1,2,4,3.

No. 1 cylinder being the one nearest the radiator.

For Timing Instruction, etc., see Magneto Book S.F.4 supplied with each roller.

CLUTCH.

A simple Ferodo lined cone clutch is fitted. (See page 22).

GEAR BOX AND GEARING.

The 2-speed gear box should contain sufficient thick machinery oil in which the lower gears may dip. The gears in this case should be run in *oil only*, no grease being added.

The bevel gears (under gear guard) should be coated with vaseline or gear grease occasionally.

A simple change speed and reversing mechanism is incorporated in the design of the gear box, by which all gear changes are performed with a single lever.

TYPES A, A2 & A3 (2 SPEED).

TO REMOVE ENGINE SUMP.

Remove Frame Stay and Stretcher Bar.

Remove Scraper Supports and Scraper.

Unscrew and remove Oil Level Indicator Pipe.

Remove all nuts securing Sump.

Raise roller frame from Radiator end about 2 ins., the Sump will now be free and may be withdrawn by tilting down at the Flywheel end to free the Oil Pump.

BLOCK BRAKE.

When adjusting Block Brake to take up wear, care should be taken to set the cranked bar (Brake Block Stop) a corresponding amount to keep the Brake Block normal to the surface of the roller.

TYPE A4-Q.

REVERSING CLUTCHES.

The Clutches are of the multi-plate type, operated by a declutching bar. The load is applied by means of a single spring and crank.

At each end of the bar a withdrawal ring is clamped by two nuts by which adjustments to the operating cones are made. To adjust for wear the inner nuts must be slacked off and the outer nut tightened up against the withdrawal rings. In addition, three setscrews are provided on the clutch operating levers for adjustment of the plates for wear.

See pages 27 and 28 for further particulars, as these clutches are generally similar to Q series.

INDEX.

NOTE :—In ordering spare parts please give Ref. No. of Roller and refer, when possible, to the Number on the detail.

"PIONEER"
MOTOR ROLLERS.

SOLE MAKERS

BARFORD & PERKINS LTD.,
PETERBOROUGH,
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