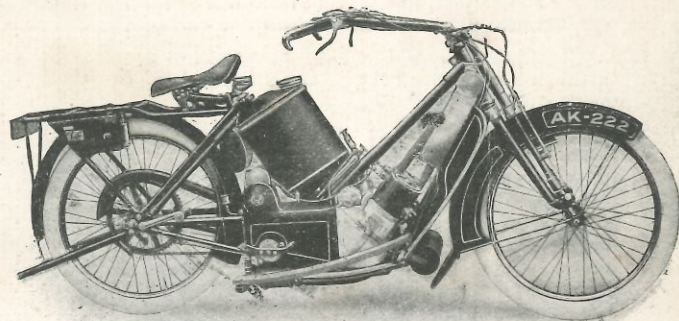


SCOTT
Motor Cycle
Instructions

MADE TO LIMIT GAUGE™



SCOTT
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"MADE TO LIMIT GAUGE"



Telegrams:—"Twin, Shipley."
Telephone 337 Shipley, 2 lines.

THE SCOTT
Engineering Co.,
Ltd.,

SALTAIRE,

SHIPLEY,

YORKS.

(1) Starting.

- (1) **Do not** start the machine on the stand. Fill up the water tank allowing a little for expansion. Fill up the oil tank. Fill up the Petrol Tank and turn on the petrol tap. See that the Crankcases contain the proper quantity of oil (see lubrication).
- (2) Close off the extra air by drawing air lever outwards.
- (3) Take the petrol injector, fill at the petrol drain tap and inject into the hexagon-headed injection nipple provided on the inlet pipe. This injection is only necessary when starting from the cold.
- (4) Flood the carburettor by holding up the needle.
- (5) Push the machine forward and kick up stand into position. Sit on the saddle and open the throttle (long lever) inwards and also advance the ignition (left hand) to mid position.
- (6) Lift up the half compression lever on left hand slightly, but **not** to the full extent, otherwise the magneto-cut-out comes into operation.
- (7) See that the gear is in neutral position.
- (8) Stand over the machine, place the ball of the right foot on the starting lever, and push **smartly** down. Do not kick the starting lever. When the engine fires, drop the half compression lever. The engine can be instantly stopped if required by fully lifting the lever on the left hand.



Fig. 1.

- (9) **To engage the gear** after advancing ignition almost full, place the heel of the foot on the rear arm of the gear lever, and press gradually into position until the gear begins to engage. Press **firmly** home. When in motion change over the high gear lever into its forward position. Press the lever **firmly** home as far as it will go, so that the gears are properly engaged. Do not allow the gears to slip for any length of time.



Fig. 2.

For starting from a standstill the low-gear clutch should be engaged more or less gradually while the machine picks up the load, then press the lever finally home. Always let the machine get well away on low gear before changing this on to high.

It is perhaps advisable to practise changing gears before going on the road, so as to thoroughly acquaint yourself with **the position** and method of actuating the gear pedal and of finding the neutral position, which is always more or less horizontal.

When changing gears do this as smartly as possible to prevent engine racing unduly, and we also recommend the half-compression lever to be raised at that moment.

(2) Starting Difficulties.

Difficulty in starting from the cold is generally due to insufficient petrol, whilst **difficulty in starting when engine is warmed up** is invariably due to overflowing with petrol, consequently, while it is of assistance to inject petrol and flood the carburettor well when starting from the cold, it is unnecessary and inadvisable to inject when restarting after engine is warmed up, since the greatest difficulty may then be experienced, and the only effective remedy is to get rid of the excess of petrol by giving full air, and clearing out the cylinders by repeated downward pushes of the starting lever.

Once the engine begins to fire the air lever should be drawn back to closed position.

Difficulty may be caused in the first instance by

- (1) **Choked jet** (see page 10). Starting difficulty may also be traced to any of the following causes.
- (2) **Oiled up plugs, due to excessive lubrication.**
- (3) **Defective plugs.**
- (4) **Rocker arm on contact breaker of Magneto stuck up, or put out of action by breakage of spring.**
- (5) **Short circuit in switch wire or switch.** This can be detected by temporarily removing switch wire from Magneto terminal, and then starting up. If the engine will then start without difficulty, examine switch wire and search for a defective place in the insulation.
- (6) **Defective carbon brush holders.** (The vulcanite insulation may have burnt through).



Fig. 3.



Fig. 4.



Fig. 5.

- (7) **Incorrect timing of Magneto** (see timing instructions, page 17).
- (8) **Firing on one cylinder** (see page 25).
- (9) **Excessive leakage from Crankcases** or fitting of inlet pipe—examine and trace where leakage occurs (see page 24).
- (10) **Attempting to start with either gear partially engaged.**
- (11) **Attempting to start with Magneto cut-out** by raising half-compression lever too far.
- (12) Wet or rain drops on porcelain insulation of plug or on vulcanite insulation of carbon brush holders.

Ease of starting is obtained by a quick smart push of the starting lever. The more rapid the motion of the lever, the better the spark obtained from the magneto, and the more effective the suction of the engine on the carburettor.

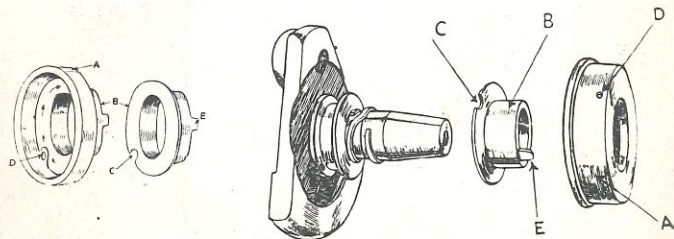


Fig. 6.

(3) Lubrication of Engine.

The "Scott" patented system of mechanical lubrication is fitted to the 1911, and later models, but cannot be fitted to the 1910 model.

This is effected without the addition of any extra moving parts, and is incorporated in the metallic packing glands on the crankshafts. The oil is fed to each crankcase during the working of the engine through a small hole (D) on the inner face of the hardened steel cups (A), in which the main roller bearings revolve.

This oil hole (D) is normally covered by the flange face of the rotating packing gland (B), which fits over and revolves with the crankshaft by reason of the tongue E, and is kept pressed up (by the action of an internal coil spring) against the inner face of the cup (A).

A small recess (C) is cut on the outer edge of the packing ring flange (B) in such a position that during its rotation the hole (D) is periodically uncovered and exposed to the maximum suction in the crankcase.

It will thus be seen that the system is quite automatic, and the oil feed begins with the starting of the engine, and is discontinued when the engine stops.

(4) Sight-Feed Controlling Device.

This takes the form of a plunger pump fitted with a screw regulating valve. To fill the pump with a charge of oil press the pump-handle (A) down, this forces the oil, which is already in the lower part (C) of the pump barrel, past the "piston washer" (D) and fills the upper part of the pump barrel (B), the coil spring (E) now forces the "piston-washer" upwards and drives the oil through the passage (F) to the controlling valve (G). If the regulating screw (H) is then slightly unscrewed, oil will be seen to drip through the valve and will then run by gravity through the pipes leading to the crankcases.

As the oil is gradually forced out of the pump the handle (A) will be seen to gradually rise, and when at the limit of its travel must be pressed down again, thus re-filling the pump. The oil travels in the first instance from the oil tubes (J and K) through the gauze filter (L) into the chamber (C).

With a new engine it is advisable to slightly over-oil for the first two or three hundred miles, and the engine should in that case use up a pumpful of oil about every three miles, but when thoroughly run in a pumpful every five or six miles will be found sufficient provided that care is taken to prevent leakages at the transfer port covers, etc. Using a pumpful of oil every three miles works out at about 200 miles per quart.

Upon starting up a new machine it is advisable to see that each crankcase is supplied with the correct amount of oil to start with. The level of oil in each crankcase should be about $\frac{1}{2}$ in. below the crankcase cover door.

It will be noticed that the drip varies according to the temperature of the atmosphere and also the density of the oil used,—being more rapid in hot weather or with thin oil and less rapid in cold weather or with thicker oil and the regulating screw will accordingly require adjusting to meet these varying conditions.

The foregoing figures are based on an average touring speed and gearing. When using a side-car, racing, or climbing long hills on the low gear, or in fact under any conditions by which a heavy load is put on the engine, slightly more oil should be given. When the oil in the tubes is exhausted the pump handle will refuse to stay down and the engine must not be run until more oil is supplied. When the

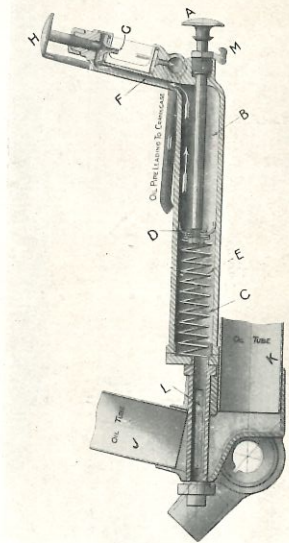
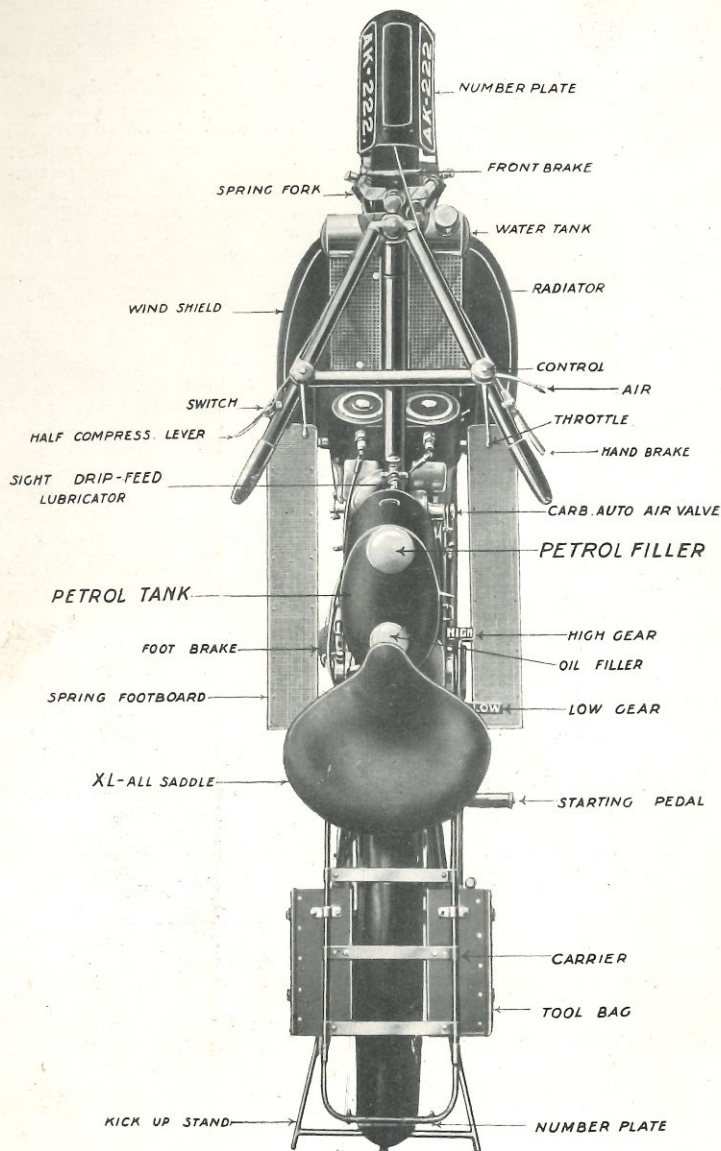


Fig. 7.



engine is at a standstill the pump handle should be pressed down and the catch (M) engaged. Upon re-starting it is merely necessary to release the catch.

It will be noted that although the supply of oil to the engine is automatically shut off when the engine stops, the oil drip will continue until the sight feed glass is full, unless the pump handle is held down by the catch,—as mentioned above.

Persistent over-oiling is to be avoided, since it tends to cause pre-ignition and knocking. With correct lubrication it should be possible to run at least 1,500 miles without removing the cylinders for cleaning.

We recommend the use of "Scott" air-cooled oil as giving the best results, and failing this Wakefield "Castrol" C.

A periodical inspection of the oil level in the crankcases should be made to ensure the oil being kept at the correct running level.

LUBRICATION OF TWO-SPEED GEAR.

The oil cup for lubricating the two-speed gear will be found attached to the back mud-guard on the right-hand side just above the gear pedal and should be filled every 100 miles with engine oil. The oil is fed centrally to all parts of the two-speed gear—first to the central thrust bearing, then to the ball bearings, and the main clutch bearings and, finally, to the expanding ring surfaces.

Although the friction clutches are not sensitive to excess of oil, holes are provided on the outer drums, so that an abnormal excess of oil can be easily washed away by petrol injection, or on the other hand, oil may be injected to assist the gradual engagement of the low gear.

CHAINS.

All the chains should occasionally be lubricated with engine oil or treated if preferred with graphite lubrication.

SPRING FORKS.

The upper sliding tube of the spring fork is packed with grease which will last indefinitely, additional lubrication can be afforded at this point by prising aside the spring cap behind the lamp bracket, and inserting oil. The slides at the fork ends should be lubricated through the hole provided (which is covered with a spring cap) every 200 miles. The rollers at the fork ends (1914 and earlier models) are lubricated by screwing down the caps of the stuffer grease cups. These must, of course, be periodically re-filled.

WHEEL BEARINGS, ETC.

A liberal supply of oil should be given to the wheel-bearings every 200 miles.



Fig. 8.

MAGNETO.

Owing to the especial nature of the ball bearing employed on this magneto, only very occasional oiling is necessary; since the efficiency of the distributor and particularly the commutator, is seriously affected by excess of oil, it is advisable to oil about every 2000 miles, and to give less oil to the commutator side. Dirty platinum points are invariably a sign of excessive oiling.

CARBURETTOR DASHPOT.

In order to damp the rapid movement of the air valve on the Carburettor intake, remove cap from end of dashpot, and insert a few drops of thin oil—care being taken to remove any surplus.

The rubber brake pad on foot brake can be softened so as to give a better grip by treating with thin oil.

(5) Leakage of Oil from Engine.

Owing to the special construction of the "Scott" engine it is possible to avoid the slightest leakage of oil at any point.

The arrangement of packing gland prevents any possibility of oil leakage at any time (whether after 100 or 1000 miles) from the crankshaft bearings, while the acrite packing on the crankcase covers makes an oil-tight joint which does not stick.

Leakage, however, may be caused if the covers are removed and laid on the roadside, and then replaced with particles of grit, etc., adhering to the packing ring face.

Further leakage may be caused at the transport covers by replacing the gauzes and jointing washers out of register with the port ledges. Leakage at this point caused by distortion of the aluminium port covers due to overheating is now entirely avoided by the complete water jacketing of the cylinder.

(6) Carburettor.

The "Scott" carburettor is semi-automatic with provision for relieving the suction on the jet caused by the loaded air valve on the intake.

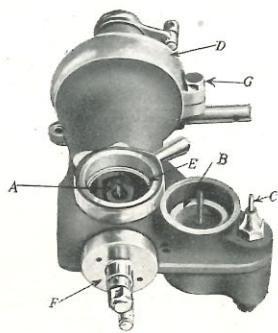
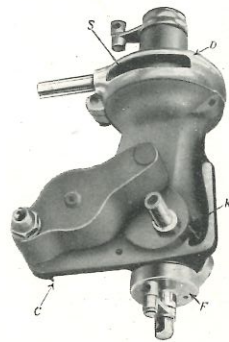


Fig. 9.



The carburettor is entirely controlled from the handlebar, the longer control lever being connected to the throttle, and the shorter lever operating the "extra air." Both levers move inwards to open.

The air lever is used to obtain the best adjustment for different conditions of weather and for varying speeds of engine, and by its operation, an additional "by-pass" air slot (S) is uncovered so that the suction on the jet is correspondingly reduced.

For starting it is necessary to shut off this extra air slot so as to increase the suction on the jet, and also to flood the Carburettor so as to temporarily raise the level of petrol in the float chamber.

At high speeds and in hot weather, the "air lever" should be advanced inwards, but retarded in cold weather, and closed for starting and slow running.

The carburettor body is fixed on the flat top of the crankcase casting and is connected by the "spring grip" inlet pipe to the "suction chamber," on which the cylinders are mounted. All parts can be easily removed without disturbing the carburettor casting.

The jet (A) can be readily extracted by moving aside the sliding cover over the same, inserting the jet key, unscrewing and withdrawing the jet.

The float (B) can be removed by taking off the float chamber lid, and the needle valve (C) can also be extracted by unscrewing the hexagon bush in which it is guided.

The air valve case (D) (complete with air valve and dashpot) is detached by unscrewing nut (G).

The throttle sleeves (E) can be removed by first of all unscrewing the lever cap (F).

It will be noticed that owing to the synchronized movement of the throttle the action on the jet is intensified when the throttle is closing and the air current is at all times central. Further, when the throttle is completely closed, an additional air slot (K) is uncovered at one side of the throttle sleeves, so that pure air enters directly into the inlet pipe.

A petrol filter is fitted on the supply pipe from petrol tap to carburettor, and we advise that this should be periodically examined and cleaned.

(7) Carburettor Adjustment (Scott).

If the bicycle is fitted with either a B. & B. or a Binks carburettor, the respective booklet will be supplied, and will be found in tool kit.

The adjustment of the carburettor for normal running should be such that the air lever requires to be fully opened only when the engine is running at speed and is warmed up, or in hot weather. If it is found that under these conditions the engine will take no extra air with advantage, and that there is evidently too weak a mixture (which is further confirmed by difficulty in starting, want of speed on full throttle, etc.), the insertion of a larger jet will be necessary, or it may be found that the existing jet is partially choked or the petrol supply in some way restricted.

The carburettor can be adjusted to give the best results for maximum power on especial occasions by the insertion of a larger jet than the

standard, and by running with the lid over the jet partially open. This is inadvisable for ordinary touring since the necessity of the extra air opening over the jet interferes with the automatic action of the carburettor.

In making adjustments it must be remembered that the action of the carburettor is dependent first of all upon the **suction of the engine**, and consequently any leakage will affect the carburettor, particularly at slow speeds, since the general effect of such leakage will be to reduce the suction on the jet, and weaken the mixture, especially at slow speeds when the effect of such leakage is most felt.

Secondly, the working of the carburettor depends upon hydraulic as well as pneumatic considerations. The alteration of size of jet is a hydraulic adjustment and is consequently less affected by variation in speed than the pneumatic adjustment afforded by the air lever. This latter adjustment is gained by relieving the suction on the jet (caused by the spring-controlled air valve on the intake) by opening "by-pass" air holes admitting air directly to the jet. It is obvious that a similar effect would be produced by weakening the spring on the air valve. We do not, however, advise any tampering with the strength of this spring, which is carefully loaded by a system of limit weights. A further adjustment can be made by altering the petrol level in the float chamber. This is controlled by the strength of spring on the needle valve, and the level of petrol in the float chamber can be raised by weakening the spring on the needle valve—or lowered by strengthening the spring. It is inadvisable to needlessly tamper with this, and it should be noted that in the "Scott" carburettor the petrol level is set about one half-inch below the top of jet, any other adjustment is wrong. The correct way to set the needle valve spring is as follows:—Turn off the petrol, remove the float, empty petrol from float chamber by means of the petrol injector, then replace the float; the spring should then be adjusted so that the weight of the float just lifts the needle valve completely off its seating.

The air valve is provided with a piston working in a "dashpot" which has the effect of damping the sudden movements of the valve. This effect is increased by the insertion of oil, but it is important that this should not be overdone, since a too sluggish movement of the valve will affect the instant acceleration gained by opening the throttle.

(8) Carburettor Defects.

Flooding of the carburettor may be caused by (1) **grit or dirt under the needle valve**. This can be generally stopped by pressing the needle firmly down and at the same time twisting it round on to its seat, or, if necessary, the needle valve can be withdrawn for examination by unscrewing the hexagon bush.

(2) **Jammed needle valve**. The needle may have jammed in the hexagon bush, or the spring keeping it down on its seat may be out of order.

(3) **Punctured float**. This can be detected by taking off float chamber lid—taking out float and shaking it to hear if petrol has leaked inside.

Choked Jet. To see if the jet is choked, move aside the flat lid over

the jet hole, turn on the petrol tap, and hold up needle valve. If the jet is clear, the petrol will issue from the jet in a small fountain. If no flow of petrol can be detected remove the jet and clean out with a fine wire, or insert a spare jet. **Persistent choking of jet**, or sluggish feed of petrol to carburettor, is generally due to the accumulation of dirt, water, or gelatinous deposit from petrol in the float chamber.

Too large a jet is the cause of want of power, and excessive petrol consumption, and can be detected by the adjustment of air lever. If the engine will run throttled down with full air, the jet is too large, and should be replaced by one of smaller size.

Too small a jet causes difficulty in starting from the cold, want of speed with full throttle, and, owing to the tendency of the weak mixture to fire back, fouls the wire gauzes on the port covers.

Always turn off the petrol tap when leaving machine.

(9) Two-Speed Gear.

The two-speed gear consists of two **friction clutches** mounted side by side, which can be alternately thrown into action by the rocking motion of the gear pedal.

There are **no gear wheels**.

All parts are made from mild steel stampings—case hardened and ground to limit gauge and since no malleable iron castings, phosphor bronze, or other soft metal wearing parts are used, the gear is practically impervious to clutch slipping.

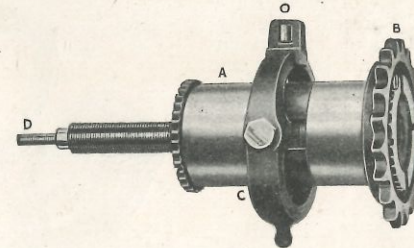


Fig. 10.

The hub (A) runs on ball bearings and drives on to the back wheel by chain from the sprocket (B).

The hub (A) contains an internal central ball bearing thrust block, pivoted by means of screws, passing through slots in the hub, to the ring-shaped thrust lever (C), so that this lever may be moved backwards and forwards during the rotation of the hub by means of the sliding rod (D) passing through the hollow spindle on which the hub revolves.

The movement of the rod is obtained by the rocking motion of the gear pedal attached to the quick thread drum (E) over the internal drum (F), which is fixed in a definite position to the right-hand frame lug.

The hardened steel drums (G) are each mounted on two ball races on each side of the hub, and are held on by screwed lock rings at each end.

The low gear drum is fitted with a large chain wheel, and the high-gear drum with a smaller wheel, and both chain wheels are directly driven by a pair of chains so that they are always in gear with the engine and revolve at different speeds, according to the variation in size and number of teeth of chain wheels.

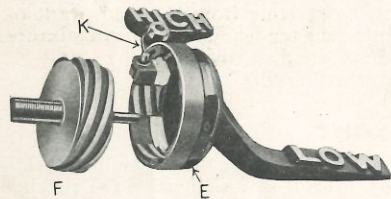


Fig. 11.

The hardened steel split rings (H) are supported on side plates, which are mounted on the hub (A), so that the pair of split rings lie side by side within the drums (G).

The opened ends of these rings are formed so as to present a slightly tapered slot (N), and are driven round with the hub (A) by the thrust lever (C), one end of which has a tongue fitting into a recess on each ring, while the other end carries a pair of rollers (O), which normally lie in between the two tapered slots.

These split rings can, therefore, be expanded by the sideways movement of the thrust lever, causing the rollers to enter the tapered slot on either ring—thus expanding the ring and bringing it into frictional contact with the inner surface of the drum surrounding it.

In the neutral (midway) position of the thrust lever and rollers neither ring is expanded, so that both rings run free, out of contact with the drums.

When the engine is started up the hub (A) is stationary with the back wheel, but the drums (G) revolve with the engine on the bearing surfaces of the hub at different rates of speed—the low-gear drum with the large chain wheel running about half the speed of the high-gear drum, with the smaller chain wheel.

Upon rocking the gear pedal backwards, the thrust lever and rollers

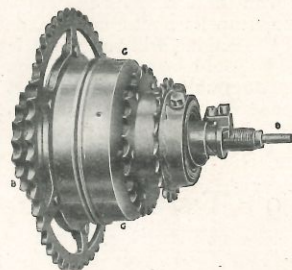


Fig. 12.

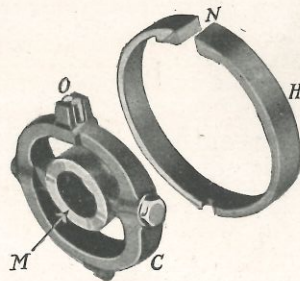


Fig. 13.

are moved so as to expand the split ring within the low-gear drum until the whole of its frictional surface is brought into contact with the inner surface of the drum, causing its gradual engagement until the drum (G) and hub (A) move together as one, and the drive is transmitted without slip to the back wheel. At the same time the high gear drum runs idle with the hub, but at a higher rate of speed.

Upon rocking the gear pedal forward, the low-gear clutch is disengaged and the high-gear drum is thrown into action in the same way, whilst the low-gear drum runs idle with the hub, but at a slower rate of speed.

Consequently the drive is always transmitted through one chain at a time whilst the other runs idle.

The pedal is retained in position by the action of an automatic grip device, which is released when the pedal is placed midway, or horizontal so that the "free engine" position can be easily found by the slack feel of the pedal in contrast to the increasing stiffness of movement as the pedal is pressed over to engage either clutch. By this means exact position, and corresponding engagement of the clutches can be gauged to a nicety by the "feel" of the pedal.

Since the magneto is driven from the high-gear drum it is impossible to run the machine with the high-gear chain removed. It is, however, possible for racing purposes to run without the low-gear chain.

(I) To Remove Gear.

The complete two-speed gear can be removed from the frame without undoing the engine chains. After removing the side-shields and under-shield take off the rear driving chain, and then unscrew and remove the bolt passing through the oil cup lug, after which remove the gear pedal and proceed to take off in the following order— $\frac{1}{2}$ -inch shoulder nut together with spring washer, outer quick thread drum and friction clip, $\frac{1}{2}$ -inch washers on end of sliding shaft, $\frac{5}{8}$ -inch hexagon nut on end of spindle, internal quick thread drum. The complete gear can then be lifted out of the lugs and after taking off the starting device the chains can be slipped off the chain wheels, and the complete gear will come away beneath the frame tubes.

(II) To alter Gear Ratios.

This can be done by substituting different size sprocket at B (19, 20, 21 and 22 tooth sprockets are kept in stock). These sprockets fit on to the hub flange and are held in place by a screwed lock ring which is further secured by a set screw. Upon unscrewing these the sprocket can be readily withdrawn and replaced by one of another size.

Care must be taken that the lock ring is driven up tight and the set screw replaced.

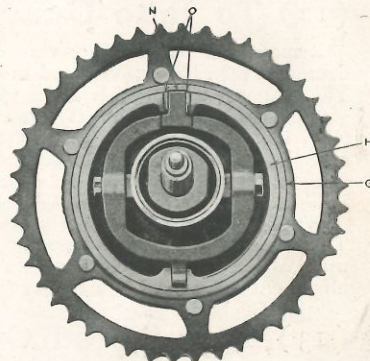


Fig. 14.

(12) To take Gear to pieces.

Remove the slotted lock ring on the ratchet side, the high gear drum can then be removed, and the split ring and side plate withdrawn. The gear will then appear as shown in Fig. 13. By then removing the screws pivoting the thrust lever C (Fig. 12) to the thrust block M (Fig. 12), which is contained within the hub, the low gear split ring, side plate and drum can be removed. Care should be taken in replacing these parts to see that the $\frac{1}{16}$ -inch balls contained in the brass ball-cages are carefully replaced.

Wear or lost motion can be taken up by inserting larger sized rollers. Take care to replace the parts in the correct way, and after replacement of the gear in the frame, see that the chains are running in true alignment and that the magneto is correctly timed (see page 17).

(13) Two-Speed Gear Defects.

Slipping clutch is due to

(1) **Insufficient friction grip on gear pedal.** The pedal is retained in either the forward or backward position by the friction grip provided by the clip (K) on the outer quick thread drum, to which the pedal is attached. To increase this grip tighten the bolt and nut securing this clip.

(2) **Excessive Oiling.** This can be remedied by injecting petrol with the petrol squirt through the small holes provided on the drum of the clutch.

Fierce action of clutch is due to want of oil—lubricate through holes in outer drum.

(14) The Starting Gear

consists of a foot lever working from the back fork lug with a bell crank arm connected by rod and chain to a ratchet drum mounted on the right-hand side of the two-speed gear inside the frame lug.

The ratchet drum (C) is mounted on a boss (A), which fits over the gear spindle. The drum contains a scroll spring (B), the inner end of which is fixed to the centre of the drum, whilst the outer end is anchored by means of the spring retainer (E) to the boss (A).

The side facing the two-speed gear is formed with ratchet teeth (D), which engage with a ratchet ring fixed on the end of the high-gear drum.

The action of the scroll spring (B) is to twist round the ratchet drum so as to draw back the chain and rod attached to the starting lever, and also to force the drum sideways towards the gear ratchet, so that both ratchet teeth are engaged—but as the starting pedal is brought back

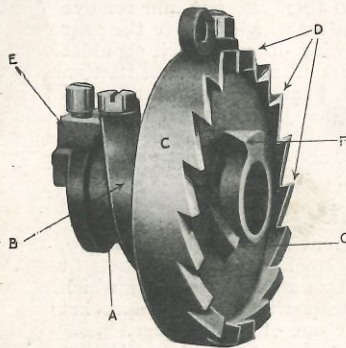


Fig. 15.

to its normal position by the rotation of the drum, the lug (F) is brought into contact with the fixed lug (G)—formed on the end of the boss (A)—and the drum is forced back so that its ratchet teeth are thrown out of engagement with the gear ratchet.

(15) Adjustment of Starting Gear.

The ratchet drum with spring and boss complete forms a separate unit, which can be supplied ready to slip on to the two-speed gear shaft.

This can be removed without taking out the two-speed gear by taking off the gear pedal and quick thread drum (see page 13). Then slacken the nut on the brake side of the gear shaft, next slacken the bolt on the underside of the right-hand lug in which the gear is mounted, so that this lug can be twisted round to allow the complete ratchet drum to be slipped off the end of the shaft while the gear is slightly lifted up.

It is necessary to wind up the scroll spring by twisting round the drum in a right-hand direction, before attaching the chain and rod to starting pedal.

This should also be adjusted by screwing up the eyebolt on the rod so that the ratchet drum is thrown out of action on the return stroke of the starting pedal.

The ratchet drum and boss should be occasionally oiled to avoid sticking.

(16) Slipping Ratchet

caused by

- (1) Drum sticking on boss, through dirt or want of oil.
- (2) Defective spring so that ratchets are not properly engaged.
- (3) Wear on ratchet teeth caused by improper setting of ratchet drum.

(17) To avoid Backfire on Starting Pedal.

Do not keep the foot on starting pedal when engine has started; allow pedal to come smartly back so that ratchet is instantly thrown out of engagement. Do not start with ignition fully advanced.

Acquire the knack of easy starting by a quick, smart push downwards.

(18) To Tighten Chains.

Engine Chains. Slacken bolts on underside of lugs (or clips) holding two-speed gear shaft to chain stays, then slide the two-speed gear bodily towards the rear wheel, taking care that both lugs are moved equally, then tighten bolts again.

Back Driving Chain is adjusted in the same manner as on the ordinary bicycle by means of the chain adjusters, great care being taken to keep the back wheel central. Tighten the nuts holding the back wheel very securely.

Magneto Chain.—This chain can be readily adjusted by loosening the three bolts holding the magneto bracket to the frame; the bracket is now free to swing upwards, thereby tightening the chain.

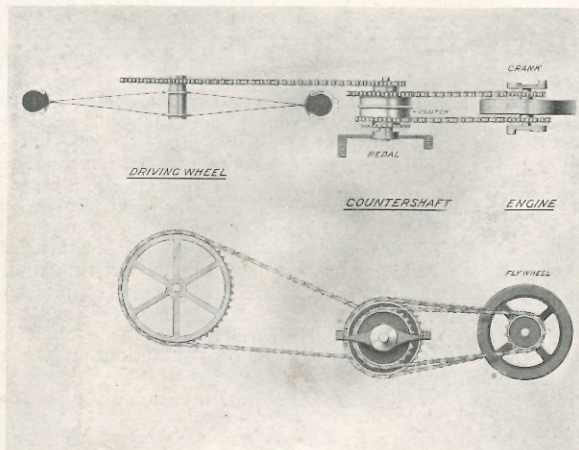


Fig 16.

After replacement of either high gear or magneto chain, it is necessary to reset the timing of the magneto (see page 17).

Breakage of chains is inevitable if the chains are allowed to run out of alignment through inaccurate setting of the gear or back wheel.

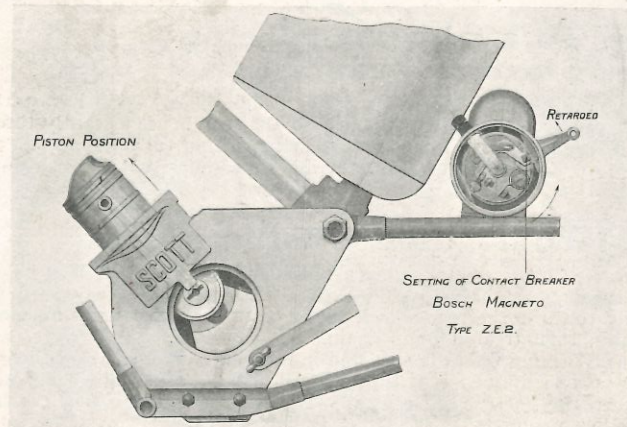


Fig. 17.
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(19) Magneto.

The Bosch ball bearing Z.E. 2 type Magneto is driven by chain from two-speed gear, and revolves at the same speed, and in same direction of rotation as the engine, giving two sparks each revolution.

The high-tension distributor on sprocket side of Magneto distributes the spark from the two carbon brush holders by means of the short insulated wires to the cylinder sparking plugs, to which they are attached by a spring grip device.

The distributor consists of a vulcanite ring fixed on to the end of the armature having a brass contact piece let into the insulation, which is wired up to one end of the high-tension winding. The two carbon brush holders (which also serve as high-tension terminals) are set at such an angle in relation to one another, that the carbon brushes are alternately brought into contact with the brass segment of the distributor during its rotation, so that the high-tension current is distributed to each terminal in turn.

These high-tension terminals are connected by the insulated wires to each plug respectively (the rear terminal to the left-hand cylinder) and it is, of course, important that all chance of leakage, caused by frayed insulation on the wire, etc., should be avoided, also the vulcanite insulation on the high-tension terminals should be kept clean and protected from dirt or wet.

(20) Timing of Magneto.

To set the timing of the magneto remove the sparking plugs, retard the ignition to its furthest extent, take off the left-hand crankcase cover so that the exact position of the piston can be clearly ascertained, put in the gear, and then turn the engine round until the left-hand piston is exactly at the top of its stroke, then slacken the nut securing the sprocket wheel on the magneto shaft, drive this loose, and set the magneto so that the platinum points are just beginning to separate (as shown on the diagram). Tighten up the sprocket wheel carefully and firmly. The rear terminal is connected with left-hand cylinder.

As you will observe, the "Scott" engine has ignition further advanced than the ordinary type of engine, for the spark occurs (with ignition retarded) slightly before the top of the stroke.

The Bosch Ball Bearing Magneto fitted to the "Scott" should not be frequently oiled.

(21) Adjustment of Contact Breaker.

This can be removed complete, for the purpose of cleaning and trimming of the platinum points—or for the renewal of damaged or broken parts by withdrawing the hexagon-headed centre bolt. The platinum points should be kept clean, smooth and true with one another, and should be adjusted so that they separate to such an extent that a thin visiting card can be passed between. The adjustment is made by means of the special small spanner provided with each machine.

The action of the contact breaker (or commutator) can be conveniently observed by turning the engine round with sparking plugs

removed, and during its rotation it will be noted that the fibre-shod end of the rocker arm is alternately brought against the steel segments fixed inside the casing, so that the platinum points are suddenly separated. Upon leaving each segment the points are again brought into contact by the action of the flat spring fixed to rocker arm.

It is consequently of importance that the rocker arm should work freely on the pivot bearing, and that the spring should be of sufficient strength to bring it back at high speeds. It is also necessary that the platinum points should separate to the right extent and, since there are two separations per revolution, these also should be equal.

This can be ensured by adjustment of the steel segments and by slackening the screws securing it to the case and inserting one or more thicknesses of paper between so as to slightly raise the segment, an increased movement of the rocker arm can be obtained from that segment until it gives exactly the same amount of lift as the other. It is important in judging this to make sure that the case is properly in place, and not tilted over so as to cause inequality from this cause. The case has a limited movement controlled by lever on handlebar and can be partially rotated so as to alter the timing of magneto. It must, however, be remembered that the best spark is only obtained with the contact breaker fully advanced, since the platinums are then suddenly separated when the armature is leaving the magnetic field at the point of greatest intensity, and consequently if the commutator is retarded, the magnetic effect is reduced when the break occurs, and the resulting spark is very much weaker.

For this reason it is never necessary or advisable to fully retard the contact breaker even when starting, and the ignition should always be more or less advanced when running.

(22) Magneto Defects.

Faults in the magneto are generally confined to the contact breaker and distributor, and are as follows:—

(1) Broken spring on rocker arm.

This is easily replaced by taking off casing, withdrawing centre bolt and removing complete contact breaker. The broken spring can then be easily replaced by new one.

(2) Rocker arm stiff or stuck up.

Take off contact breaker, slide aside spring blade holding rocker arm on to its pivot bearing, remove rocker arm (this can be done without taking off spring), clean and oil fibre bush bearing in which rocker arm pivot works. In replacing contact breaker, take care that the key or tongue on contact breaker boss enters the corresponding keyway or slot on end of magneto shaft.

(3) Defective carbon brush holders.

To remove these it is necessary to detach the magneto from the frame. The carbon brush holders are fixed to the magneto by two small screws. The ends of the carbon brushes which bear against the distributor should be trimmed by scraping with a knife or file, and the distributor ring can also be cleaned, if dirty through excess of oil, by injecting petrol through the terminal holes. A defect in the vulcanite insulation of the carbon brush holders may be detected by first of all finding out which one is at fault by alternately detaching the high-

tension wires from the sparking plugs whilst engine is running, and holding end of wire about $\frac{1}{8}$ -in. from metal part of engine, and noting if either wire gives no spark—or only sparks occasionally. Then by changing over the carbon brush holders it can be determined if either of these is actually at fault by the resulting improvement of spark from the same high-tension wire.

(23) Unusual Magneto Defects.

(1) **Defective condenser.** This is quickly detected by the excessive sparking at the platinum points, accompanied by abnormal pitting and burning of the platinum (this, of course, should not be confused with the somewhat similar effect caused by lubricating oil getting on to platinum points), also by the poor spark obtained.

(2) **Defective wiring in armature.**

(3) **Weak magnetism in field magnets.**

The only remedy for these defects is to return magneto to the makers. Before imagining that the magneto is defective from any of these causes, see if improvement is made by careful attention to adjustment as previously directed.

(24) Magneto Cut-Out.

This is operated in combination with the half-compression lever from the handlebar.

The purpose of this is to provide that the magneto cut-out is only operated upon half compression, in order to avoid the sudden jerks in the drive caused by the constant switching on and off on full compression. For this reason we do not advise the fitting of any extra direct-acting switch to the magneto.

The handlebar lever is provided with a small spring plunger which is brought into contact with an insulated switch bolt passing through the handlebar tube, from which an insulated low-tension wire is carried to the cut-out terminal on the contact breaker case of magneto.

(25) Defective Switch.

This may be detected by detaching switch wire. The insulating fibre bushes by which the switch bolt is insulated from handlebar may be defective, and can be readily replaced, or the bushes can be restored by boiling in paraffin wax.

(26) The Engine.

The action of the "Scott" two-stroke engine is fully explained on page 19 of our catalogue.

The twin cylinders of the 1911, and later models are completely water-jacketed and together form a monobloc casting readily detached from the crankcase by the removal of the four outside bolts.

It is not necessary or desirable to periodically remove cylinders, since carbonization is almost entirely prevented by the even temperature ensured by the water cooling, and by the regular system of lubrication.

The piston rings can be examined without removing cylinders by taking off transfer port covers, and the exhaust ports can be also got at for occasional examination or cleaning by removal of exhaust pipe.

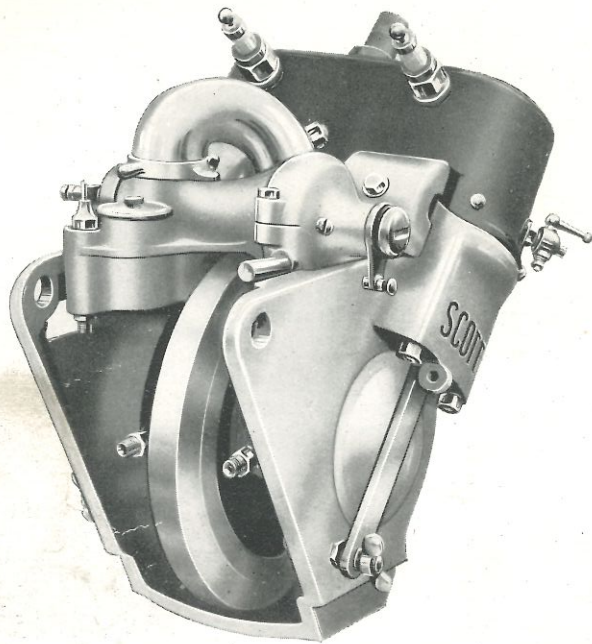


Fig. 18.

The plated cylinder head rings can be unscrewed giving access to jacket without disturbing the radiator.

The crankcase covers are quickly removed by unscrewing wing nut, and sliding aside cover bar. Do not attempt to run the engine with either of these covers removed or improperly replaced.

(27) To take off Cylinders.

Drain out water from radiator and cylinders by drain tap. Take out sparking plugs, remove the central bolt holding the silencer ends and slip the silencer down. Remove one exhaust port cover and detach the half compression actuating rod. Take off transfer port covers, slip off both rubber tube connections to radiator, remove radiator by withdrawal of the four fixing bolts passing through radiator. Slacken off

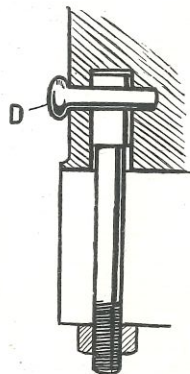


Fig. 19.

cylinder holding down nuts (A) and draw out cotter pins (D). The cylinder casting can then be lifted off crankcase, leaving pistons projecting from crankcase casting. In replacing cylinders take great care that the rubber cylinder base rings are correctly fitted (if these are stretched or damaged new ones should be fitted). It is equally important that the linen cylinder joint washers between the cylinders and top of crank-case should be replaced if defective since any suction leak here materially affects the action of the carburettor. Care must also be observed in guiding the piston rings into their grooves while the cylinders are being replaced.

(28) To take off Pistons and Connecting Rods.

Detach crankcase cover bar, insert the milled end into slot on crankpin screw and twist round, bearing in mind that the right-hand crank screw has a left-hand thread, and the left-hand crank screw a right-hand thread. This is indicated by the letters R and L stamped on the screws. After unscrewing the crankpin screw the piston and rod can be removed by placing crankpin at top of stroke—the rod will then come off sideways and the rollers inside the bearing should be collected and put together. Do not mix up the rollers from each side together. The piston and connecting rod is a complete unit, and we do not advise any attempt to separate the rod from piston. If difficulty is experienced in unscrewing crankpin screws, tap the end of bar while attempting to unscrew, this will slacken the grip on the threads.

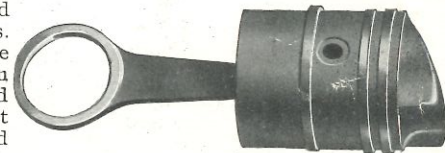


Fig. 20.

(29) Piston Rings

are easily removed by raising ends over the piston and moving the ring round until it mounts over the piston body, replace rings the right side up—that is with the bright side facing the lower face of the grooves. On no account replace by fancy rings with step cut ends, etc., or with rings other than the special hammered and ground rings supplied.

(30) Crankshaft, Main Bearings and Packing Gland.

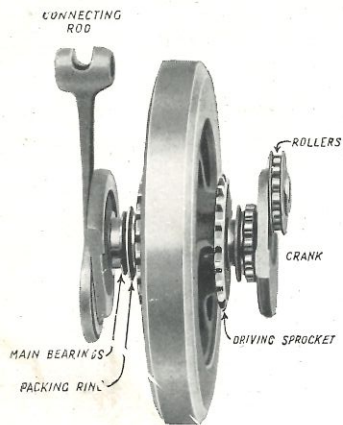


Fig. 21.

We do not advise the removal of the crankshafts by any but the most expert and skilled hands. These are, however, readily removed with the use of a box spanner. First of all unscrew left-hand locknut on right-hand crank. Then partially unscrew bolt head on left-hand crank. By means of a smart blow on the bolt head the right-hand crank may be driven out, the bolt can then be further unscrewed and withdrawn, allowing the right-hand crankshaft to be removed complete with rollers and packing gland.

The left-hand crank can then be similarly withdrawn by inserting a rod from right-hand side and driving the crank out of flywheel by a smart blow.

The greatest care must be taken in replacing cranks; first of all make sure that the tongue on packing gland enters the keyway in flywheel and finally tighten up bolt and locknut as tight as possible. The left-hand locknut should also be slightly riveted over to prevent any chance of working loose.

(31) To take Engine out of Frame.

- (1) Remove rubber pipe connection to radiator, leaving radiator in position.
- (2) Undo patent spring clip fasteners and detach engine chains.
- (3) Take off inlet pipe, transfer port covers, oil pipes, petrol pipe, and remove carburettor holding down screws.
- (4) Take off right-hand exhaust port cover, and remove half compression rod.
- (5) Remove central bolt holding the silencer ends and slip silencer down.
- (6) The engine fixing bolts may then be withdrawn and the engine moved forward in the frame to permit of the removal of the carburettor.

The engine can then be lifted out of the frame.

When replacing engine tighten up engine bolts securely, and time magneto as directed on page 17.

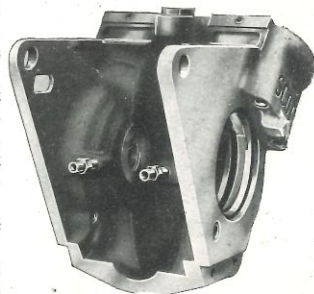


Fig. 22.

(32) To Remove Flywheel.

This can only be taken out of crankcase when engine is out of frame, or lifted up from frame bracket to permit of flywheel being passed out. It is, of course, necessary first of all remove cylinders and detach piston rods and crankshafts as previously directed. In replacing flywheel see that it is put back the same way.

(33) Engine Chain Wheels.

These are fixed by four long $\frac{1}{4}$ -in. rivets passing through bosses on flywheel vanes, and can be removed for replacement by drilling out the countersunk ends of the rivets on one side, and driving out same. Since these sprockets are made from case-hardened UBAS steel and have a comparatively large number of teeth (20) they last indefinitely and show no trace of wear after many years' running. Consequently renewal of the sprockets is seldom necessary. It must be remembered that **only 20th sprockets** can be fitted to the engine, otherwise the ratio of gear to magneto will be affected.

(34) Half Compression Valves.

The function of these valves is to reduce the compression in the cylinders by admitting access to the exhaust pipe from an additional exhaust port placed above the main exhaust ports. When this is opened to the exhaust the effective stroke of the piston is decreased, since compression will then only begin when the piston has travelled far enough to close off this extra port—resulting in about half the normal compression in cylinder.

Since these valves are not exposed to the extreme temperature and pressure produced by the explosion at the beginning of the power-stroke, it is not necessary to ever grind them in, or to otherwise attend to them beyond seeing that they do not stick up through gumming up—failure of springs—or incorrect setting of the operating tappets.

These should be set so that both valves get down upon their seats, and a space of about $\frac{1}{16}$ in. can be allowed between the valve stem heads (D) and the tappet arms fixed to the shaft carried on the exhaust pipe casting. The amount of lift on the valves can be adjusted by sliding the clip to which is fixed the outer Bowden wire covering, and securing it in correct position on the frame tube.

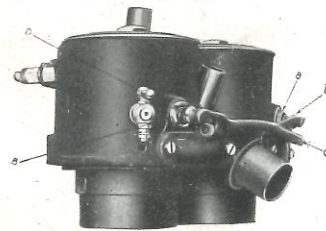


Fig. 23.

The end of the inner wire cable is connected through the medium of a short stiff tension spring to the lever (C), operating the half-compression shaft. The purpose of this spring is to permit of a further movement of the hand lever after the valves are opened, in order that the switch cut-out can be brought into operation after the compression is thus reduced.

The valves can be removed without taking down cylinders, by unscrewing the lock rings (B) securing them in position.

(35) Transfer Port Covers.

The port covers are easily removed by unscrewing the single central holding bolt. This should not be screwed up more than is necessary to close the stiff spring washer inserted between head of bolt and the cover—since the strain caused by screwing up too tight is likely to distort the aluminium casting.

(36) Wire Gauzes.

The wire gauzes which are inserted between the port cover faces and the cylinder and crankcase port faces are now provided complete with jointing washers fixed on both sides, and by means of the ledges formed on both the crankcase face and cylinder face they can be placed in register with the ports without difficulty. The purpose of these gauzes is to prevent back firing into the crankcase—due to late firing of the charge—which is caused by weak mixture, or defective ignition. The engine can be run for racing purposes, etc., without the gauzes and no advantage is gained by constantly examining and replacing them.

Owing to the complete water jacketing of the cylinder, the gauzes are kept cool, and consequently do not burn out, while the cleansing effect of the petrol vapour tends to keep them clean.

(37) Leakage from Wire Gauze Joints

may be caused by (1) careless replacement of the gauzes.

(2) By unequal thickness of jointing washers at top and bottom of port cover.

(3) By distortion of port cover, or crankcase caused by screwing up excessively tight.

(4) By defective packing joints.

Separate jointing washers are supplied, as well as the complete gauzes and washers combined.

(38) Engine Defects.

The efficiency of the engine depends equally upon good cylinder compression and good crankcase compression. The cylinder compression is easily tested by the starting lever and each cylinder should be the same.

Defective compression in the cylinders may be due to

- (1) Faulty or broken piston rings.
- (2) Want of oil.
- (3) Stuck up half-compression valves.
- (4) Leakage from sparking plugs.

It must be remembered that poor cylinder compression, with considerable leakage past the piston affects the suction in the crankcase. Owing to the water cooling the piston rings do not gum up in their grooves and there is no possible distortion of the cylinders, so that if the rings

are not actually broken the compression will always gradually improve with the running of the engine.

Defective crankcase compression can be tested by removing the cylinder plugs and turning the engine smartly round **backwards way**. The sudden "blow through" from the crankcase will then be observed at the plug holes and any weakness in either cylinder can be noted.

This may be due to (1) leakage at the crankcase covers, transfer ports or injection nipples, (2) want of oil, (3) grit between packing gland and face, or sticking of gland on crankshaft. This can be cured by a smart blow on end of crankshaft; (4) hole in crankcase caused by separation of engine chain due to insufficient fastening of spring clip joint or by breakage of chain caused by running on the road without under-shield, thus allowing stones, etc., to be thrown up on to sprocket wheels; (5) leakage caused by faulty joint between cylinders and piston well ledge in crankcase, due to careless replacement of cylinders.

Owing to the "Scott" system of spring supported metallic packing gland, whereby all wear on the hardened steel faces of the glands is automatically adjusted, there is no possibility of crankcase leakage after prolonged running, in fact it may be said that the only effect of wear is to improve the running joint.

Firing on one cylinder is commonly due first to **defective ignition** (which in turn may be caused by faulty plugs or defect in magneto); (2) very rarely to **defective crankcase compression**; (3) **to water in crankcase**, due to leakage from water jacket. This is only likely to show up after machine has been standing for any length of time, and since the jackets of the cylinder are subjected to a hydraulic test there is very little chance of trouble from this.

The cylinder which is not firing can be readily detected by alternately detaching high-tension wires when engine is running and noting on which cylinder the engine is firing.

Owing to the smoothness of running of the "Scott" two-stroke engine, it is difficult for the uninitiated to tell whether the engine is firing on both cylinders except by the unusual loss of power.

For very slow speed in traffic on top gear, there is no harm in running with one cylinder wire detached. This, of course, means a heavy petrol consumption.

Loss of power can often be traced to partial choking up with burnt oil of the silencer exhaust drain pipe and particularly of the small silencer which should be removed and cleaned at least every 500 miles.

To remove this silencer detach the right hand footboard and give the silencer a smart pull outwards and backwards. The silencer and drain pipe will come away together. The small silencer can then be removed by undoing the set screw.

(39) Radiator.

(Made by the Pendleton Radiator Co., Manchester).

The honeycomb radiator is fixed to the frame brackets by three bolts passing through the radiator tubes (which are here protected by end ferrules), so that by the withdrawal of these bolts the radiator is quickly removed from the frame.

The level of water in radiator should be kept above the tubes. The water can be drained off by the drain tap on engine water jacket—or more quickly by detaching rubber tube connections. The radiator can be occasionally cleaned out by rinsing with soda and water.

The air passages in the honeycomb portion of the radiator should be kept free from any accumulation of dust or mud, otherwise a considerable amount of the cooling area will be lost.

(40) Leakage of Water

from radiator tubes can be temporarily stopped by plugging up the defective tube with a spare bolt with washers at each end. This is not likely to occur with the special strong radiator provided.

Leakage from rubber tube connections can be cured by the use of insulating tape or by replacement of rubber tubes. Leakage from the jacket head can be stopped by tightening down the nickel-plated lock ring with a hammer and blunt chisel, or by replacing the rubber packing washers.

In frosty weather it is advisable to drain off water.



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