FITTING AND ADJUSTMENT

CYCLE FRAME

Before fitting a Sturmey-Archer variable gear hub to any cycle frame make sure that the chainstay ends are parallel. If they are not, the hub axle will be strained when the nuts are tightened, and the internal mechanism may be seriously damaged.

HUB WIDTH

The over-all width of Sturmey-Archer rear hubs over the cone locknuts, as supplied from the Works, is $4\frac{5}{16}''$. If necessary, it can be reduced to $4\frac{1}{16}''$ by removing the spacing washer on the left-hand side and the cone locknut on the right-hand side. Unless the same amount is removed from both sides the chain line will be affected.

CHAIN LINE

The chain line is the distance from the centre line of the bicycle to the centre line of the teeth on the sprocket and is best measured as follows:

1. First see that the hub has the necessary spacing washers and locknuts to make up the proper width for the fork ends to which it is to be fitted.
2. Measure the distance over the cone locknuts and divide it by two.
3. Measure the distance from the outside of the right-hand cone locknut to the centre of the sprocket teeth and deduct it from the figure obtained in 2 above. The result is the chain line measurement.

With the hub, as supplied from the Works, it is possible to obtain any chain line between $1\frac{1}{2}''$ and $1\frac{3}{4}''$ in $\frac{1}{16}''$ steps as follows:

$1\frac{1}{2}''$. With the dished face of the sprocket facing inwards, and both washers outside of the sprocket.

$1\frac{9}{16}''$. With the dished face of the sprocket facing inwards and one washer each side of the sprocket.

$1\frac{5}{8}''$. With the dished face of the sprocket facing outwards and both washers outside.

$1\frac{11}{16}''$. With the dished face of the sprocket facing outwards, one washer inside the sprocket and one outside.

$1\frac{3}{4}''$. With the dished face of the sprocket facing outwards and both washers inside the sprocket.

The dust cap behind the sprocket must always be fitted centrally to avoid rubbing against the right-hand ball ring, otherwise the hub may run noisily.

SPROCKETS

Modern sprockets, as fitted to all Sturmey-Archer hubs, have three small semi-circular splines, corresponding to grooves in the driver, and these splines are secured in position by a spring ring (circlip) which clips into a narrow groove cut round the outside of the driver boss. The sprocket slides into position, with two $\frac{1}{16}''$ spacing washers which are always used, and the circlip is then sprung into the groove. (By varying the position of the washers and the dishing of the sprocket, the chain line may be modified as previously explained.)

To remove a sprocket, prise off the circlip with a thin screwdriver at the spline groove nearest the gap in the circlip, so that the spacing washers and sprocket may be lifted off.

For all hubs, sprockets are supplied in sizes from 16-tooth to 20-tooth as well as 22-tooth for $\frac{1}{2}''$ by $\frac{1}{8}''$ chains, and 18-tooth and 19-tooth for $\frac{1}{2}''$ by $\frac{3}{16}''$ chains. For the 'A' range of sports hubs 14-tooth and 15-tooth sprockets can also be used providing that the K228 right-hand ball ring and K229 dust cap are fitted.

The screwed driver (K507) and the 12-splined driver (K657) are no longer available. Hubs in which they were used must be converted by fitting the (K462) 3-splined driver and sprocket as a complete unit (including spacing washers and circlip).

GEAR RANGES

Gear ranges may be raised by changing the sprocket for a smaller one or lowered by changing the sprocket for a larger one. The effect of the change may be calculated by multiplying each existing gear by the number of teeth on the original sprocket and dividing the result by the number of teeth on the proposed new sprocket. For example, a gear of 66·4 obtained with an 18-tooth sprocket becomes 74·7 when a 16-tooth sprocket is fitted. $\left(\frac{66{\cdot}4 \times 18}{16} = 74{\cdot}7\right)$

HUB GEAR CONTROLS

The gear-control mechanism of Sturmey-Archer hubs is either a trigger control or else a small lever in a quadrant, connected by means of a wire cable to the indicator coupling which protrudes from the hub itself.

Before 1953 the type of *trigger control* known as the GC2 was used for both three- and four-speed gears. It can be recognized by the words '3- or 4-speed' on the medallion, and by the cable guide or ferrule which is part of the control wire and unscrews from the casing. Later models of that type (also known as the GC2) have a small window in the outside casing, through which letters on the control lever, showing the gear in use, are seen.

Since 1953 separate models have been supplied for three-speed (the GC3A) and four-speed hubs (GC4A). They are similar to the earlier GC2 except that the number of steps on the control lever is different and, of course, the medallions show whether they are designed for three-speed or four-speeds. The latest type of GC4A have the numbers 1, 2, 3, 4, stamped on the outer edge of the medallion, to indicate the gear position.

The latest and slightly smaller three-speed control known as the GC3B has the numbers 1, 2, 3, stamped on the outer edge of the medallion, to indicate the gear positions. It also has a rather shorter lever and a different pawl spring and pawl.

The GC2A control, *for ASC hubs only*, has the same pawl, pawl spring, and lever as the GC2, but the *other internal parts are not interchangeable*. It can be recognized by the letters 'ASC' on the medallion.

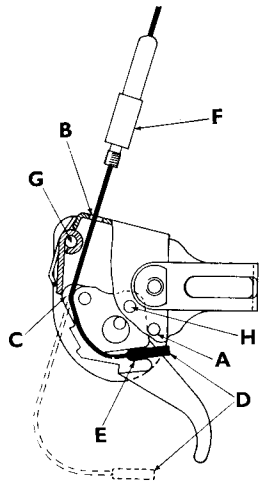
To remove the wire from a trigger control

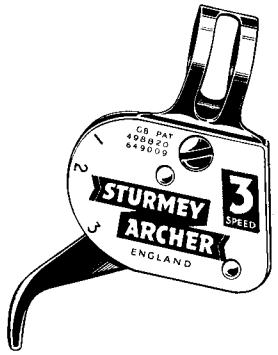
The control itself need not be detached from the handlebar, if the lever can be pulled far enough back to allow the cable nipple to pass between the pawl and the ratchet plate.

1. Detach the inner wire from the indicator chain at the hub.
2. Detach the outer casing from the fulcrum clip and pull the cable ferrule (F) upwards until the screw thread engages with that of the control casing at B, and then unscrew the ferrule.
3. Pull the lever right back beyond the bottom gear position to stop A, and push the inner wire through to detach the nipple from the ratchet plate.
4. Pull the wire out between the pawl and the ratchet plate at C and through threaded hole B.

To fit a wire to the trigger control

1. Pull the lever right back beyond the bottom gear position to stop A.
2. Insert the wire through the threaded hole B and between the pawl and the ratchet plate at C.





3. Fit wire nipple (D) into notch E.
4. Screw cable ferrule (F) into control casing at B until it rotates freely.
5. Keeping tension on the wire, push the lever forward into the top-gear position.
6. Control is now ready for re-connection to hub.

The pawl and pawl spring are designed so that they cannot drop out if the control wire breaks or when it is being removed or replaced. Normally, they should not need to be renewed and so they are not easily detachable. If a new part has to be fitted, both rivets (G and H) must be removed and the complete trigger mechanism withdrawn. New rivets will have to be used when the new part has been fitted.

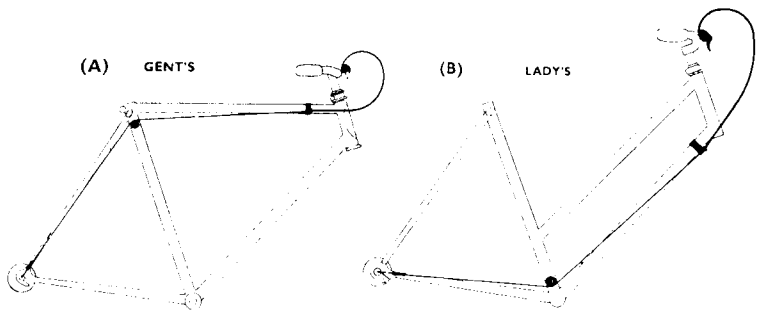
HUB GEAR CONTROLS

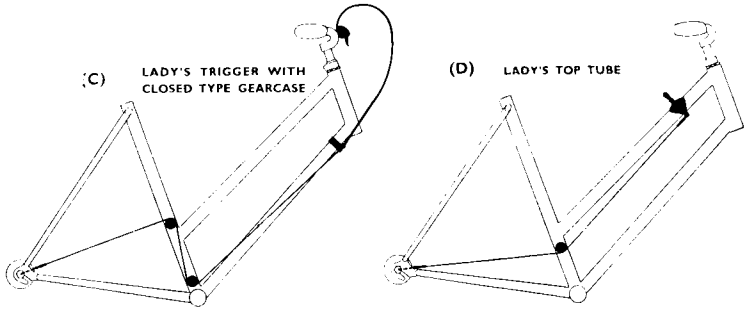
1. *Trigger Control.* The outer cable should be long enough to allow full movement of the handlebar but otherwise it should be kept as short as possible, because it tends to compress in low gears, and any length over $21\frac{1}{2}''$ may adversely affect the gear adjustment.

Control wires are supplied in various lengths but the general standard for handlebar controls is a $54\frac{1}{2}''$ inner wire with a $17\frac{1}{2}''$ outer cable which is suitable for most frame sizes. Longer wires, up to $58\frac{1}{2}''$ and outer cables up to $21\frac{1}{2}''$, are available for special cases, and shorter wires can be supplied for very small frames.

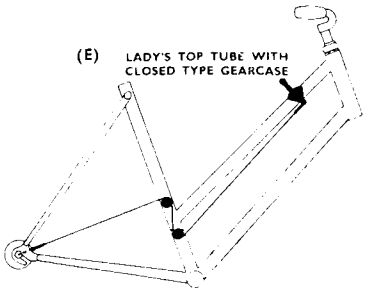
Diagrams A and B show the best method of arranging the control wire on diamond and open frames. If the open frame is fitted with a gear-case, however, an extra guide pulley may be needed as shown in diagram C.

2. *Top Tube Control.* The wire should run parallel to the tube to which the quadrant is fitted. If the tube is curved the wire should be parallel to the section of tube to which the control is fitted. The wire lengths offered for Top Tube controls are 32″, 34″ and 36″.





For Top Tube controls on diamond frames, the quadrant should be attached in the position shown for the fulcrum in diagram A. On open frames where a gearcase is fitted, the method is shown in diagram E, but it is less efficient and should not be used if the method shown in diagram D is possible.



There should be no difficulty in joining up the control wire to the indicator chain except with the AW, AB, AG and TCW hubs. In these cases the indicator must be screwed up fully but not overtightened. The effect of overtightening is shown in the illustration. The indicator must be unscrewed to line up; it should be noted particularly that it need never be unscrewed more than half a turn. Unscrewing more than half a turn will detrimentally affect gear engagement. This only applies on AW, AB, AG and TCW hubs because in all other types the indicator rod is free to revolve and line itself up automatically.

BRAKE HUB CONTROLS

It is very important that the brake-arm clips are fitted as tightly as possible to the cycle frame or the fork. It is also important that the brake plate should not be strained when a rear-wheel brake is being connected to the anchor clip, which must be fixed so that it engages easily. The arm of a front hub should be a tight fit in its clip.

Brakes on machines that have been laid up for some time should be cleaned and one or two drops of oil should then be applied between the cam lever and the brake plate, to prevent sticking, but care should be taken to see that no oil penetrates into the brake drum.

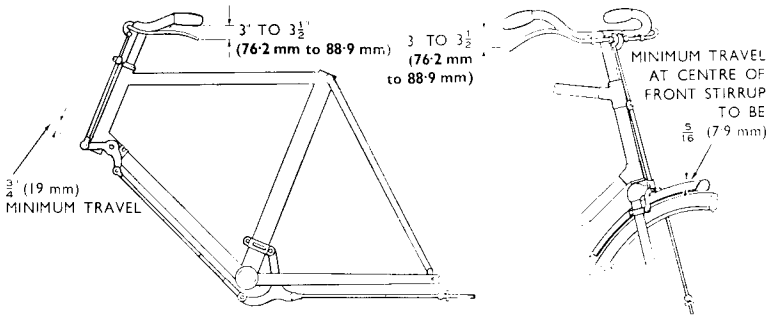
All rear-wheel brake hubs have axles with flatted ends, to prevent them from turning in the frame slots. This is especially important with combined brake-and-variable-gear hubs, for which special lip washers are provided, to engage in the frame slots.

To allow ample room for movement of the rod operating a rear-wheel brake, there should be half an inch of clearance between the brake link and the bottom bracket.

In the case of the front hub brakes it is not possible to interchange rod and cable control without exchanging the brake arms, but all rear hubs use the same brake arm for either rod or cable control.

Handlebar fittings for rod-operated brake hubs must provide the minimum movement as shown in the diagrams overleaf, at the stirrup (for front-wheel brakes) and at the bell crank (for rear-wheel brakes). Hubs are supplied with fittings up to and including those parts, but the handlebar fittings and brake tubes are supplied by the cycle manufacturers. When a cycle is being converted from rim brakes to hub

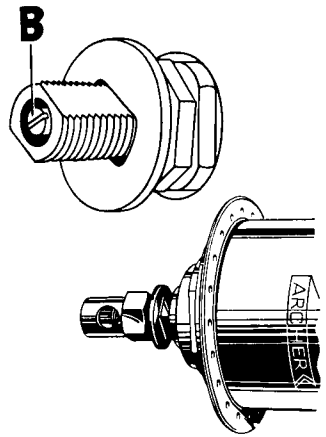
brakes, a longer tab may be required for the roller lever operating the rear brake in order to provide the minimum movement required.



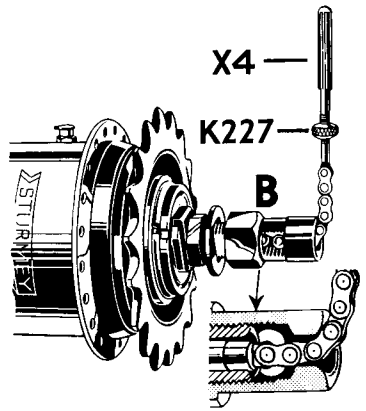
HUB GEAR INDICATOR ADJUSTMENT

The indicator rod of three-speed hubs should be adjusted when the control lever is in the normal gear position, i.e., No. 2. The small locknut above the chain is first slackened off and then the knurled wire connection is rotated so as to bring the rod into the required position. With SW, SB, SG, AM, ASC and AC hubs the required position has been obtained when the end of the indicator rod is level with the end of the axle on the left-hand side of the hub. With AW, AB, AG and TCW hubs it is brought into position by bringing the outer shoulder of the indicator rod level with the end of the axle on the right-hand (sprocket) side. (See B in illustrations.)

LEFT-HAND INDICATION



RIGHT-HAND INDICATION



For four-speed hubs, FW, FM, FC and FG, adjustment is made when the control lever is in the low gear, i.e., No. 2 position (the one next to the bottom gear position). The locknut is slackened off and the knurled wire connection is revolved to bring the end of the indicator rod level with the end of the axle on the left-hand side. (See B in illustration.)
In all cases the locknut must be tightened again after adjustment.
If the knurled wire connection cannot be turned enough to give the required adjustment of the indicator rod, the position of the fulcrum (in the case of trigger controls), or the quadrant (in the case of top tube controls) should be moved along the top tube in the required direction, so that the final adjustment may be made on the wire connection as described. At the first sign of the gear slipping in any position, the indicator adjustment must be checked.

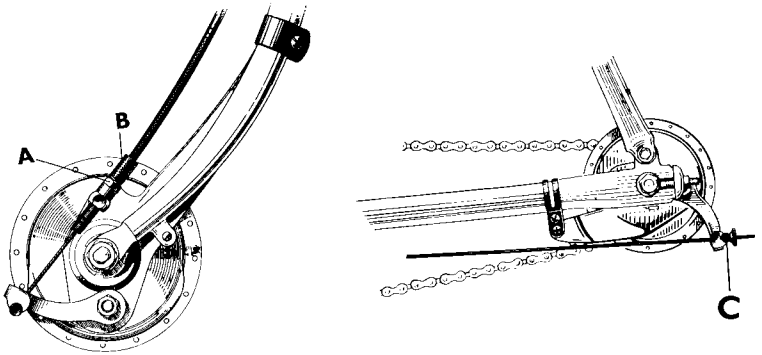
HUB BEARING ADJUSTMENT

The hub bearings are adjusted by means of the cone on the left-hand side (opposite side to the sprocket) which automatically adjusts all the hub bearings. It should be adjusted so that there is a barely perceptible sideways movement of the wheel rim.
With brake hubs the left-hand cone projects through the brake plate and is fitted with a slotted adjustment washer. With a rear 'Dynohub' the left-hand cone projects through the armature and is fitted with a slotted adjustment washer. Turning the washer adjusts the cone, which must be locked again with the locknut after adjustment.
When a dynamo is incorporated in the hub the pull of the magnet disguises the adjustment and if this point is not kept in mind the wheel may be over-tightened and the ball races damaged. The position of the armature terminals should be carefully located before the cone locknut is finally tightened.
For all hubs fitted to roadster cycles, the terminals should be parallel to one of the flats on the end of the axle but with forward drop-out lugs they should be turned clockwise through 30° away from a position parallel with the flats.
GH6 lighting sets should have the terminals parallel with the axle flats. The notched washer has not been fitted to GH6 hubs since 1954 when the adjusting cone was transferred to the side away from the 'Dynohub'.
Before spinning a wheel to test the output of the 'Dynohub', ensure that the axle nuts are tight, otherwise the terminals may foul the front fork and be damaged if the axle revolves.
The right-hand cone (on the sprocket side) is fixed in position when the hub is assembled and must not be disturbed for wheel adjustment in the normal way. When re-assembling the hub after dismantling for inspection or repair, the right-hand cone should be screwed home until it is finger-tight, then unscrewed half a turn and finally locked with the

special lockwasher and locknut. On no account should it be unscrewed more than half a turn as this will upset the setting of the gears. Wheel adjustment is then made in the normal way with the left-hand cone.
If the right-hand cone races are being inspected without removing the internals from the hub shell, the left-hand cone must first be screwed well back so that it does not interfere with the re-setting of the right-hand cone.

HUB (BRAKE) ADJUSTMENT

When brakes are new they may have to be adjusted frequently (until the shoes have become properly bedded in).
With cable-operated brakes the small locknut (A in the diagram) is first slackened off and then the knurled adjuster (B in diagram) is tightened until the brake shoes are felt to be rubbing on the inner surface of the hub shell. The adjuster is then slackened just enough to allow the wheel to revolve without friction, and the locknut is tightened up again.



With rod-operated brakes the adjuster (C in the diagram) is turned until the brake shoes rub on the inside of the drum, and then slackened off just enough to allow the wheel to revolve without friction. The adjuster is self-locking.
This is the only point at which the brake should be adjusted. The handlebar brake tubes are only provided to allow up-and-down adjustment of the handlebars.

HEADLAMPS S625 and R625

Two types of headlamp are available.

1. Type S with 2″ diameter dome for sports models in silver finish only.
2. Type R with $3\frac{1}{4}$″ diameter dome for roadster models in black and silver finish.

Both are fitted to the lamp bracket by means of a single clamping bolt. The angle of the lamp may be adjusted but first the clamping bolt should be loosened.
The front of the lamp is detachable by unscrewing the small screw at the bottom of the lamp rim and this will give access to the bulb and switch sockets. The switch itself is riveted at the base of the lamp body and the switch lever has three positions, which, viewed from the riding position, are: Battery—left, 'Dynohub'—right, Off—central. When a Dry Battery Unit is not fitted, the left-hand position may be used as 'Off' and the switch treated as an ordinary two-way switch.
The bulb-holder is a push fit into the base of the reflector, and a lock-ring is provided to secure the bulb which allows it to be focused. Correctly adjusted, the bulb need not be touched again except to re-focus or replace with a new bulb.

REAR LAMP M6

The rear lamp is fixed to the rear stay by a suitable clip. Four types of clip are available to fit $\frac{5}{8}$″ diameter round, $\frac{1}{2}$″ diameter round, and oval or 'D'-shaped tubing. Prior to the present lighting regulations a $1\frac{1}{8}$″ diameter dome was fitted but the current dome is $1\frac{1}{2}$″, behind which is fitted a loose metal backing piece which can be fitted into the existing size lamp body. The dome is unscrewed to give access to the bulb.

BULBS

Head: 6v. ·25 amp. Symbol No. GL448. } Correct bulbs
Rear: 6v. ·04 amp. Symbol No. GL228. } must be used.

DRY BATTERY UNIT (DBU) GA393

The Dry Battery Unit is fitted to the seat tube. The unit takes three $1\frac{1}{2}$ volt dry cells which are fitted from the lower end of the unit and secured in position with a spring ring which fits into a groove inside the base of the container. This groove forms the earth connection for the spring ring and must be kept clean. It is suggested that the groove and spring ring be smeared with vaseline as a precaution against corrosion. Batteries are not re-chargeable and should be replaced with new cells when exhausted or removed from the container to avoid corrosion on the inside surface of the container. If the batteries are removed without replacing with new ones the 'Dynohub' lighting will still function normally but the parking light will not function. The most common type of batteries used are Drydex T20, Ever Ready U2 or Ray-O-Vac, but any similar size battery is suitable.
There are two terminals fitted in the head of the battery container and as these are of different sizes the wires cannot be wrongly connected. The battery cap is of rubber with a small hole in the top through which the centre terminal passes. The sides of the battery cap should be pulled well down over the flex wires to prevent rain or mud penetrating

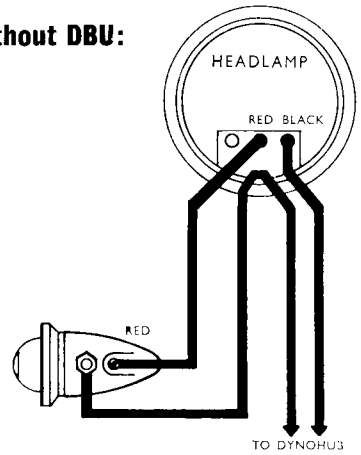
into the container and the cap should be secured in position by means of a plated washer (GL541) and terminal nut (GL613).

WIRING

Wiring connections are inside lamp; wires enter the lamp through a hole in the fixing bracket. To reach the connections the lamp front must be removed.

(1) For GH6 front 'Dynohub' without DBU:

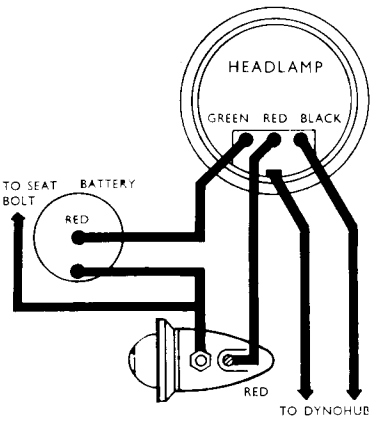
Headlamp End. Black wire to upper right-hand switch connection. Red wire to centre switch connection. Two bare wires to lower switch connection.
'Dynohub'. Two hook connections to hub terminals.
Rear Lamp. Black wire (large tag) to clip screw. Red wire (small tag) to recessed screw.



GH6 FRONT DYNOHUB

(2) For GH6 front 'Dynohub' with DBU:

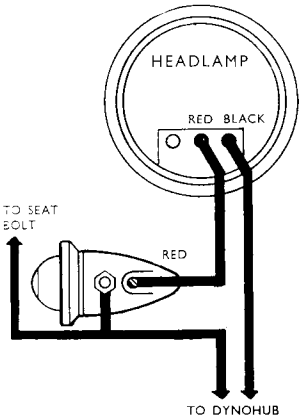
Headlamp End. Black wire to upper right-hand switch connection. Bare wire to lower centre connection. Red wire to upper centre switch connection. Green wire to upper left-hand switch connection.
'Dynohub'. Two hook connections to hub terminals.
Rear Lamp. Black wire (large tag) to clip screw. Red wire (small tag) to recessed screw.
Battery Container. Red wire (large tag) to centre terminal. Black wire (small tag) to side terminal.
Earth Wire. Rear lamp clip to seat bolt.



WITH DBU

(3) For SG, AG or FG rear 'Dynohub' without DBU:

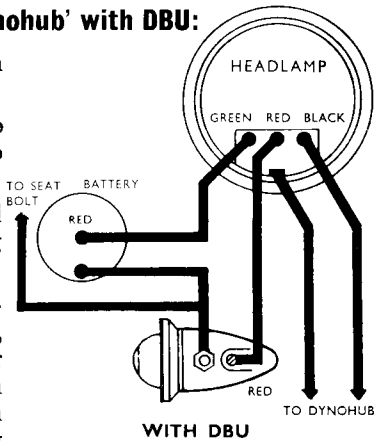
One hub connection to upper right-hand switch connection. Upper centre connection to rear lamp recessed screw. Other hub connection to rear lamp clip screw. Earth wire—Rear lamp clip screw to seat bolt.



WITHOUT DBU

(4) For SG, AG or FG rear 'Dynohub' with DBU:

'Dyno-hub'. Two large hook-on tags to the two hub terminals.
Rear Lamp. Small tag (red) to recessed screw, large tag (black) to clip screw.
Battery Cap. Large tag (red sleeve) to centre terminal, small tag (black sleeve) to other terminal.
Headlamp. (1st pair) Bare connection to base connection (earth), the other connection to upper right-hand switch connection (black). (2nd pair) Red connection to centre connection, the remaining connection (green) to upper left-hand switch connection. (Any surplus wire should be coiled inside Headlamp.) Earth wire—Rearlamp clip screw to seat bolt.



WITH DBU

N.B.—All illustrations show switch plate as seen in headlamp with front removed.

END OF SUB-SECTION 1.—SERVICE SECTION—STURMEY-ARCHER MASTER CATALOGUE