

# "THE TRADER" REPAIRERS' SUPPLEMENT-12

## COSTED STURMEY-ARCHER REPAIRS

### Notes on the A Type Range

**L**AST year an entirely new range of Sturmey-Archer gears was placed on the market. The first of the range was the AR type, which gave the enthusiasts a shock in that it was the first time that a variation between gears equivalent to less than one cog tooth could be obtained on a completely enclosed epicyclic gear.

During the development of this most interesting gear several improvements in design and in ease of production were evolved, and it was decided to incorporate these in the other hubs.

The result is that every three-speed hub which leaves the Sturmey-Archer factory to-day embodies these improvements and modifications, and the range is known as the A range. Broadly speaking, the standard IAW type hub is similar in design to the old K type, and many of the overhauling operations are the same. The medium and close ratio hubs with compound gear trains are, however, different in many respects.

### ADJUSTMENT

The internal construction of the hub is such that only two external adjustments are necessary from time to time in order to keep the device functioning correctly. The first is the normal cone adjustment for the bearings, which is effected by means of the adjustable cone on the left-hand side of the hub exactly as was the case with the older K types. This cone has a right-hand thread, and is secured by a locknut.

To adjust, slacken the spindle nut and locknut, adjust cone until all shake has disappeared. Tighten locknut and spin wheel to make certain there is no binding. If wheel binds, slacken cone slightly, tighten locknut and re-test. Repeat until wheel neither binds nor shakes.

*Time, 3 mins. = 1½d.*

### ADJUSTING CONTROL

On "A" type hubs the indicator is on the same side as the control, and is viewed through a slot in the extended spindle nut.

The adjustment of the gear control affects the reliability of the gear if it is not carried out correctly, since the dog clutches will not engage properly and will consequently be loaded much more heavily.

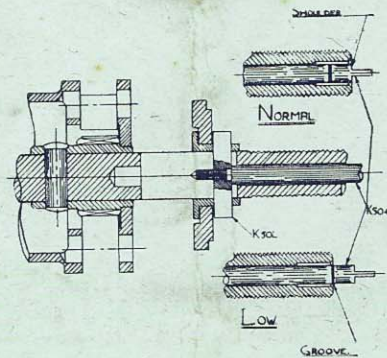
The indicator is screwed direct into the Axle Key, and it is essential that this indicator is screwed up fully, as otherwise the control adjustment will be upset.

It is probable, of course, that when

screwed up tight the chain and connection will not line up with the control wire, and will have to be turned back to bring it into line, but it is never necessary to turn back more than half a turn for this purpose, since the chain can be arranged to point either upwards or downwards without turning the indicator spindle.

In all cases correct adjustment is obtained by placing the control lever in the middle gear notch. Then unscrew the locknut on the screwed connection at the chain end of the hub, and adjust the knurled connection fitted to the wire until the shoulder on the indicator (where the chain is connected) is level with the end of the axle. This can be seen through slots in the right-hand nut.

If this method gives insufficient adjustment further adjustment can be obtained by sliding the clip on the top tube control, or the fulcrum clip



This drawing shows the correct positions for the indicator

A further series of costed repair jobs on Sturmey-Archer 3-speed hubs. The models dealt with here are the models now being produced

in the case of the handlebar control, along the frame tube in the required direction.

A control was adjusted by means of the sleeve and locknut, and the following time was taken:—

*Time, 2 mins. = 1d.*

### LUBRICATION

With these adjustments properly carried out, the only attention required is lubrication, and customers should be recommended to add about half a teaspoonful of Sturmey-Archer Hub Lubricant (keep a stock of this) every 150-200 miles. Grease or gummy oils must on no account be used, since they prevent the pawls from operating correctly.

If the cycle is put away for a period do not omit to see that it is first carefully cleaned and oiled, and occasional oiling afterwards is desirable to prevent rust forming on the internals.

It will be seen that any adjustment required is of the simplest nature, and that only in the case of extreme neglect or old age will overhaul be required.

### CLEANING

Follow exactly the same procedure as described under this heading in Supplement No. 10, which dealt with K-type hubs. Twenty minutes is an average time for this job, but it naturally depends on the time taken to remove and replace the wheel.

### ADJUSTING SIDE BEARING

To examine and, if necessary, renew the adjusting side bearing, the first step is to disconnect the control and remove the spindle nuts and the cycle chain. The wheel can then be removed from the machine. Next, remove the indicator and chain by unscrewing in anti-clockwise direction.

Next place the sprocket end of the spindle vertically in the vice, unscrew the locknut, and remove the ¼in. spacing washer and cone on the left-

## Costed Sturmey-Archer Repairs—continued

hand side. The spacing washer is omitted where the hub is required to be only  $4\frac{1}{8}$ in. wide overall.

The dust cover comes off with the cone, when the caged ball bearings can be examined. When replacing the balls remember that the solid side of the cage faces the cone.

If due to neglect or long use, this bearing requires renewal, a new cone, new balls with retainer or cage, and a new ball cup (the part which screws into the hub shell) may be required. This ball cup has the only left-hand thread used in the A.W. or A.B. hubs.

Remove the spindle from the vice and turn the wheel over. Grip the flats on the ball cup in the vice and rotate the rim in a clockwise direction to remove the ball cup.

The time taken to replace a worn adjusting side bearing was as follows:

	s. 7.
Time taken, 27 minutes ..	1 1½
Material: Cone, 9d.; balls,	
4d.; ball cup, 2s. 6d. ..	3 7
	4 8½

### THE SPROCKET SIDE BEARING

Insert the adjusting cone end of the spindle vertically in the vice, remove the locknut, the lock washer and the cone (right-hand thread) from the sprocket end. The locknut is omitted if the hub must be only  $4\frac{1}{8}$ in. overall.

On this side of the hub there are two ball races—one between the spindle and driver (to which the cog is fixed) and the other between the



The hub assembly as it appears immediately after removal from the shell

driver and the ball ring, but there are no loose balls in either race.

Now lift out the driver complete with ball cage, dust cap and sprocket, and also the coil spring used to return the sliding clutch to the high gear position. The driver ball cage is held in place by the dust cap, which is a light press fit inside the driver race.

### DRIVE SIDE BALL RING

If the drive side ball ring is to be replaced, or if the gear ring and other parts are to be dismantled, it is best

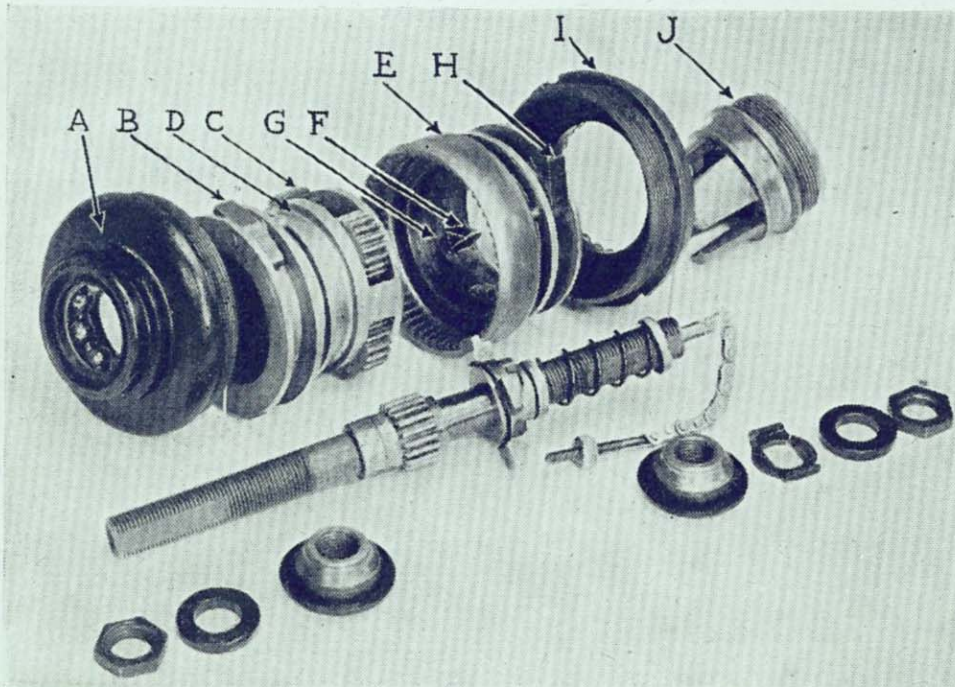
to remove the ball ring from the hub first of all.

Start by dismantling the adjusting side bearing as described earlier in this article, and then mark carefully the position of the driving side ball ring in relation to the hub shell. This is necessary, since the ball cup has a two-start (right-hand) thread, and if it is put back in the alternative position the wheel may not run true.

The operator can now lean over the wheel, prevent it from rotating by pressure of his body against the rim, and unscrew the ball ring in an anti-clockwise direction with light taps on a soft metal drift, when the whole of the contents of the hub, except the left-hand ball cup, can be removed from the shell. The mechanic now has a nice compact job to work on, since the hub shell and rim can be placed on one side.

To reassemble, tap the ball ring home in the hub, making sure that the marks coincide when it is fully home. Assemble the balls in the large race of the ball ring. There are twenty-four balls of  $\frac{3}{8}$ in. diameter held in place by a steel retainer over them. When this retainer or inner dust cap is pressed on, the balls should be free to turn but should not fall out. The driver, complete with ball cage and dust cap, can next be fitted, followed by the clutch spring, complete with small steel cap, and then the R.H. cone.

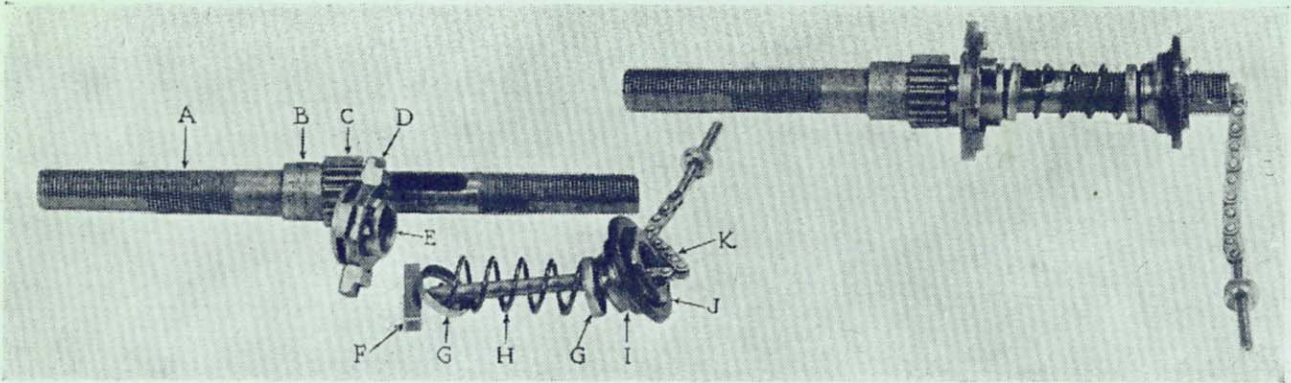
When replacing the caged balls in the driver remember that the solid side of the cage faces the cone. The same remarks apply to the left-hand side ball race. Note here the new



An "exploded" view of the A.W. hub showing some of the parts mentioned in the text:

- A Ball cup with balls.
- B Planet cage pawls.
- C Planet wheel.
- D Planet cage.
- E Gear ring.
- F Gear ring pawl.
- G Gear ring dog.
- H Gear ring pawl.
- I Ball ring.
- J Driver.

In the foreground are the spindle parts (detailed elsewhere) and the cones, washers and lock nuts.



**THE SPINDLE PARTS.** A spindle is shown dismantled and assembled. Parts are as follows: A, Spindle; B, Sun Wheel Dowel; C Sun Wheel; D, Sliding Clutch; E, Control Sleeve; F, Axle Key; G, Spring Cups; H, Control Spring; I, Cone; J, Dust Cap; K, Control Rod and Chain.

system of channel-section dust caps to protect the hub against the entrance of mud and to retain lubricant. One of these is fitted to the driver, and another outside the axle cone faces in the opposite direction, so that the free edge of each fits within the channel of the other.

The next step is to screw up the right-hand cone, thus positioning the gear ring, ball cup and driver. This cone should be screwed up with the fingers as tightly as possible and then slackened back not more than half a turn, which is just sufficient to allow the parts to revolve freely on the axle, the adjustment then being correct. Next place the lock washer in position with its lips over the squared end of the cone, and secure it in place by means of the lock nut. The latter may be omitted if it is essential that the hub be only  $4\frac{1}{16}$  in. wide.

A wheel was removed from the frame, all bearing parts replaced, and the wheel reassembled, adjusted, and replaced. The time taken was as follows --

	s. d.
Time, 56 minutes .. ..	2 4
Materials: Indicator side parts as listed previously, 3s. 7d.; ball ring, 2s. 6d.; cone, 10d.; balls, 4d.; drive dog balls, 4d.; drive dog, 3s. .. ..	10 7
<hr/>	
Total .. ..	<hr/> 13 11

To replace with new driver, balls, and cone is, of course, a much cheaper job. The time for this operation was also checked and found to be 28 minutes.

### REMOVING PAWLS FROM GEAR RING

Remove adjusting side bearing complete. Remove drive side ball ring from hub shell, carrying the mechanism with it. Hold spindle in vice by adjusting cone end. Remove driver and ball ring.

Lifting the ball ring complete with balls held in place by a steel dust cap exposes the two pawls on the gear ring. The pawl pins can be pushed out and the pawls removed, care being taken not to lose the small "R" springs. The gear ring itself can also be lifted off.

### REMOVING GEAR PARTS

After removing the bearings, ball ring, driver, and gear ring, there now remain to be removed the sliding clutch, the control sleeve, and the



**BUILDING UP**—The drive dog is being placed in position

planet cage. Lift off the steel cap covering the axle key, and push out the axle key itself, then the sliding clutch, and the sleeve can be removed. Follow up by removing the planet wheel pins, which are merely a sliding fit in the planet wheel cage and sliding the planet cage off.

The pawls at the end of the planet cage are fitted in exactly similar manner to those in the gear ring, but in this case they are reversible, so that when one end becomes worn they can be turned round, and need not be replaced until both ends are worn. In reversing, both pawls should be reversed at the same time to ensure even pressure in use.

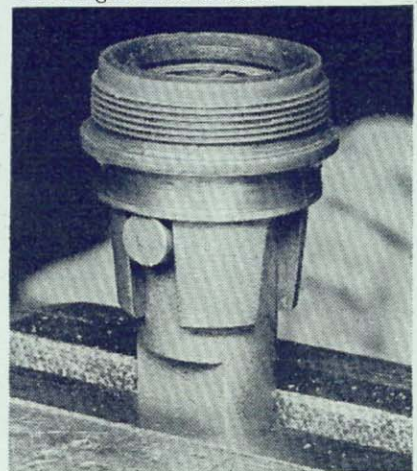
### FITTING A NEW SUN PINION

It has not been mentioned in the above description that the sun pinion may be replaced or transferred to a new axle where necessary, but this is possible in the case of A.W. and A.B. hubs. This pinion has a short sleeve drilled to take a dowel, and the axle is similarly drilled for this dowel. It is not, therefore, a difficult matter to change the sun pinion or the axle when either of these parts happens to be damaged. At the same time great care must be taken that the axle is not bent or the pinion end cracked.

### REMOVING THE COG

Now to describe the removal of the cog from the driver. For this a special fixture and a chain wrench are required. The special fixture can be obtained from the factory. It is of a different type to that used on K-type hubs and is illustrated here.

Remove wheel and place spindle in vice, cog upwards. Remove lock nut, washer, and cone. Lift off cog and driver. Hold driver in fixture and unscrew cog with chain wrench. The cog has a right-hand thread.

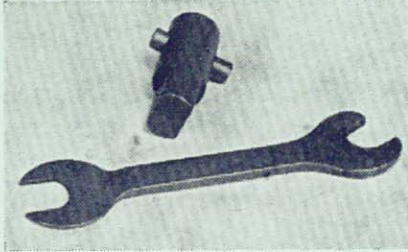


This view shows the driver dog held in its special fixture for cog removal

## Costed Sturmey-Archer Repairs—continued

Fit new cog, reassemble and adjust as described.

	s.	d.
Time, 20 minutes .. ..	10	
Cog .. ..	1	6
<b>Total</b> .. ..	<b>2</b>	<b>4</b>



The only tools required—the special driving dog fixture and a cone and locknut spanner

### REASSEMBLY

When the sun wheel has been fitted the axle can be assembled. The planet cage must first be fitted over the axle, slip on the axle sleeve and the sliding clutch and slide the axle key through the slots in the sleeve, placing the steel cap over the key to hold it in position.

The planet wheels are then inserted and the pinion pins dropped into place. These pins project from the planet cage to form the high-gear driving dogs, so examine the projections for wear and fit new pins if necessary.

### REFITTING PAWLS

Then replace the pawls and springs in the planet cage, taking care that the pawls point in the correct direction for driving, and also in the gear ring, and insert the pawl pins. For this purpose place the pawl spring in position alongside the pawl, and holding the foot of the spring in position with the thumb and finger on the nose of the pawl, slide both into position together. Have the pawl pin or spindle ready in the left hand, to drop in before releasing the hold on the pawl and spring. Compress the pawls in the gear ring with the thumb and first finger, and drop the right-hand ball ring over them. Be sure to see that the dogs inside the gear ring are not rounded at the corners. Those nearest the teeth form the middle gear drive from the sliding clutch, and those nearest the pawls take up low gear. Reassembly from this point has already been described.

### BRAKE HUBS

These instructions apply equally to the A.B. hubs, which are similar in

construction but also incorporate the now well-known internal-expanding hand-operated brake. The brake parts are not altered from the K.B. 1937 pattern, but the same special box spanner will be required for removing and re-fitting the left-hand ball cup which has to be sunk within the brake drum (left-hand thread).

The left-hand cone on all brake

hubs is extended so as to project through the brake side-plate and two flats are formed on the end of the extension, over which is fitted a thick slotted washer. A "C" type spanner is provided with every new hub to fit this slotted washer so that the adjustment of the wheel bearings can be carried out as easily as with any ordinary hub.

## THE A.M. MEDIUM RATIO HUB

This hub provides three speeds with the ratios closer together than the A.W. type, and is becoming increasingly popular for sports touring models. The construction only differs from the A.W. type in respect of the planet cage and pinions. The sun pinion on the axle has only 15 teeth, and this means such a small diameter that it has to be cut solid with the axle and is not detachable as is that of the A.W. and A.B. hubs.

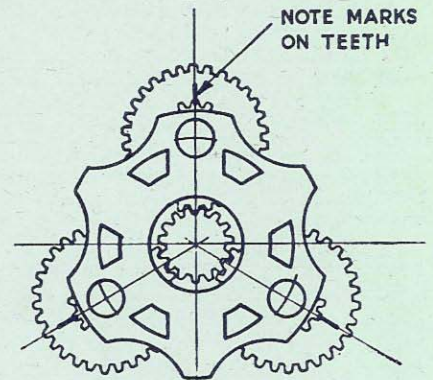
The planet pinions are of compound type, having 25 teeth at one end and only 14 teeth at the other. The large end only of each planet engages with the sun pinion and the small end only is in mesh with the internal teeth of the gear ring. On this account it is essential to set all three planet pinions correctly when assembling the planet cage, otherwise it will be impossible to fit the gear ring without the teeth binding. This would prevent the hub from turning more than one or two revolutions before some of the teeth would be seriously damaged.

The large end of each planet pinion has one tooth specially marked for this purpose. These marks must all be set radial with the centre of the planet spindles and the hub axle before the pinion spindles are dropped in place. The diagram given will make this quite clear, but all three pinions must be correct; if only one is out of position, trouble is certain.

Owing to the size of the planet

pinions only three can be fitted, so that the pinion spindles cannot be used as the high gear driving dogs on this model. The planet cage, therefore, carries these dogs, as in the old K. model.

It should also be noted that with this model when specially ordered, the makers can supply 14- or 15-tooth



This drawing shows how the A.M. Planet wheels should be assembled

sprockets, but this necessitates the use of a special splined fitting, and to adapt this a special driver, right-hand ball ring, ball retainer and single dust cap have to be used. Two spacing washers and a lock ring are also necessary to secure the sprocket on the driver. Both washers are fitted outside the sprocket for the usual 1½ in. chain line.

## FAULT FINDING

**ALL GEARS.**—Check control adjustment before doing anything else. If correct and slip occurs on all gears, the sliding clutch is probably faulty.

**HIGH GEAR.**—The drive is from driving dog to sliding clutch to planet wheel spindle ends. Planet wheels drive gear ring at increased speed. Drive taken from gear-ring pawls to ball ring.

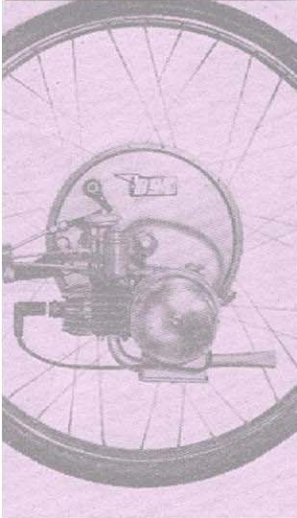
If top gear slips, examine planet wheel spindle ends and gear-ring pawls.

**NORMAL GEAR.**—The drive is from driving dog to sliding clutch to dogs inside gear ring and nearest to planet cage. Thence through gear-ring pawls. Examine gear-ring dogs if normal slips.

**LOW GEAR.**—Driving dog to sliding clutch to second row of dogs on gear ring. Sliding clutch holds gear-ring pawls out of engagement. Gear ring drives planet-wheel cage at reduced speed. Planet-cage pawls drive hub shell.

Examine gear-ring dogs and planet-cage pawls if slip occurs.

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