

		s.	d.
X.69.	Clip Screw, Black, for Fulcrum Clip and Pulley	...	...
X.111.	Clip Screw Nut, Plated, for Control	...	...
X.111A.	Clip Screw Nut, Black, for Fulcrum Clip and Pulley	...	...
GA.246	Trigger Control Quadrant complete with fixing screw and nut (state whether for $\frac{7}{8}$ ", 1" or $1\frac{1}{8}$ " handlebars)	...	...
GA.246Z.	Trigger Control complete with solo length wires and one pulley	...	...
GA.246AZ	Trigger Control complete with tandem length wires and two pulleys	...	...

NOTE:—When ordering complete controls it is necessary to state:—

1. Diameter of handlebar, i.e. $\frac{7}{8}$ ", 1" or $1\frac{1}{8}$ ".
2. Diameter of top tube for fulcrum clip, i.e. $\frac{7}{8}$ ", 1" or $1\frac{1}{8}$ ".
3. Diameter of seat tube for guide pulley, i.e. 1" or $1\frac{1}{8}$ ".

TOOLS.

X.44A.	Spanner for Nuts and Cones	...	...	...	...	9
DD.5978.	Driver Holder for Sprocket Removal	...	...	...	...	3 3
GD.514.	Tool for removing L.H. Ball Cup	...	...	...	...	6 0

GUARANTEE.

Sturmey-Archer Hubs (which expression shall include spare parts thereof) are guaranteed against defects of manufacture for a period of 12 months from the date of sale providing they are still the property of the first retail purchaser. This guarantee is subject to the conditions specified below.

With all hubs we give a special guarantee instead of the guarantee implied by statute or otherwise as to the quality or fitness for the purpose of cycling of hubs supplied by us, any such implied guarantee being in all cases excluded.

We guarantee, subject to the conditions mentioned below, that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, but damage for which we make ourselves responsible under this guarantee is limited to the free supply of a new part in exchange for the part of the hub which may have proved defective, and does not include the cost of fitting. The purchaser shall not be entitled to claim any damage whatever, save replacement of the defective parts. This guarantee does not apply to defects caused by wear and tear, misuse or neglect.

If a defective part should be found in any of our hubs it must be sent to us carriage paid, accompanied by an intimation from the sender that he desires to have it replaced free of charge under our guarantee, and he must also furnish us at the same time with the date of purchase. Failing compliance with the above, no notice will be taken of anything which may arrive, but such articles will lie here at the risk of the senders and this guarantee shall not be enforceable. We guarantee only new hubs. A hub bought second-hand is not guaranteed by us.

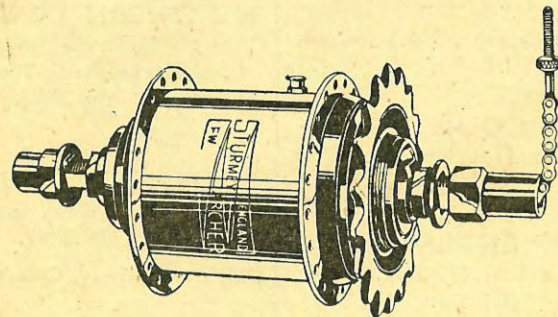
Sturmey-Archer

F.W.

WIDE RATIO

4-SPEED HUB GEAR

Speed with Ease



Fitted with Patented
Sturmey-Archer Handlebar
"Flick" Trigger Control

STURMEY-ARCHER GEARS LTD.
LENTON BOULEVARD
NOTTINGHAM

Telephone: 75154.

Telegrams: "Triple, Nottingham."

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HEAD OFFICES :

LENTON BOULEVARD, NOTTINGHAM, ENGLAND

TEL. NOTTINGHAM 75154.

LB.405. Outer Dust Cap for K.507 or K.517	...	...	...	...	9.	1 1/2
K.506Z. Axle Cone with LB.404 Dust Cap fitted	...	...	...	...	1	1 1/2
K.516. Lock Washer for R.H. Cone	...	...	...	...	1	1 1/2
K.418. Hub Shell, 40 holes	...	...	...	...	5	6
K.418A. Hub Shell, 36 holes	...	...	...	...	5	6
S.545. Lubricator	...	...	...	...	1 1/2	1 1/2
K.517. L.H. Ball Cup	...	...	...	...	3	6
K.227. Locknut for Indicator Coupling	...	...	...	...	1	1 1/2
K.47A. Cone Locknut	...	...	...	...	1	1 1/2
X.42A. Axle Washer 1/8" thick (Spacing Washer)	...	...	...	...	1	1 1/2
K.62. Outer Dust Cap for Ball Ring	...	...	...	...	3	3
X.49. Sprocket Washer (only used for special chain lines)	...	...	...	...	1 1/2	1 1/2
X.48. Sprocket, 18 teeth	...	...	...	...	1	5
X.48E. Sprocket, 16 teeth	...	...	...	...	1	5
X.48C. Sprocket, 17 teeth	...	...	...	...	1	5
X.48D. Sprocket, 19 teeth	...	...	...	...	1	5
X.48F. Sprocket, 20 teeth	...	...	...	...	1	5
K.521. Axle Washer	...	...	...	...	1	1
N.190. L.H. Axle Nut	...	...	...	...	8	8
N.200. R.H. Axle Nut...	...	...	...	...	8	8
HANDLEBAR "FLICK" TRIGGER CONTROL.						
K.731. Pivot Pin for Control Pawl	...	...	...	...	1	1
K.732. Control Pawl	...	...	...	...	4	4
K.733A. Spring for Control Pawl	...	...	...	...	2	2
K.735Z. Inner and Outer Wires complete with 57 1/2" inner wire for solo cycle	...	...	...	...	2	10
K.735AZ. Inner and Outer Wires complete with 72 1/2" inner wire for tandem cycle	...	...	...	...	3	2
K.735. Wire Nipple for control end of wire	...	...	...	...	1 1/2	1 1/2
X.105. Wire Nipple for hub end of wire	...	...	...	...	1 1/2	1 1/2
X.82. Outer Cable, 17 1/2" long	...	...	...	...	1	5
K.734. Cable Ferrule for Control Quadrant	...	...	...	...	1 1/2	1 1/2
X.83. Cable Ferrule for Fulcrum Clip	...	...	...	...	1 1/2	1 1/2
X.116Z. Fulcrum Clip complete for 1" diameter bar	...	...	...	...	6 1/2	6 1/2
X.116AZ. Fulcrum Clip complete for 7/8" diameter bar	...	...	...	...	6 1/2	6 1/2
X.116BZ. Fulcrum Clip complete for 1 1/8" diameter bar	...	...	...	...	6 1/2	6 1/2
X.78Z. Pulley complete for 1" tube	...	...	...	...	1	3
X.78BZ. Pulley complete for 1 1/8" tube	...	...	...	...	1	3
X.90. Control Clip Screw, Plated	...	...	...	...	1	1

CHANGING GEAR.

The gear-change is quick and easy in action and should be made smartly, to avoid risk of chipping the engaging dogs whilst only partially engaged. It is advisable just to ease the pressure on the pedals whilst the control lever is moved, without actually ceasing to pedal forwards.

BEARING ADJUSTMENT.

The right-hand cone is fixed at works and should not be disturbed unnecessarily. It should be adjusted with left-hand cone slackened right back, and must be screwed up finger-tight until it causes bearings on that side of hub to bind, and should then be unscrewed just half a turn and secured in that position by means of the special lock-washer and locknut.

With the right-hand cone correctly fixed, the whole of the bearings are simultaneously adjusted by screwing up the left-hand cone. When correctly adjusted, secure with locknut provided.

INDICATOR ADJUSTMENT.

Gear indication is by means of the rod projecting from left side of axle. With control lever in No. 2 position (intermediate low gear), the end of the indicator should be exactly level with end of axle.

To adjust, slacken locknut K.227 and turn knurled connection X.4 on end of wire, until indicator is level with axle end; then secure by tightening up locknut again.

If this gives insufficient adjustment, move cable fulcrum clip nearer to steering head, then make final adjustment as above.

In No. 4 position, the indicator should project $\frac{1}{32}$ inch out of axle. If this dimension is exceeded, indicator has become unscrewed, and should be screwed up gently, holding the chain and using small screwdriver in slot at end of indicator. Care must be exercised in this operation, as the thread is necessarily a very fine one, and will strip if too much force is used.

LUBRICATION.

Use only Raleigh All-Purpose Oil.

Before using a new hub, or one that has been stored away for some time, inject one teaspoonful through lubricator in hub shell; then add from one-quarter to one-half this quantity at least once every fortnight afterwards, or every 200 miles if you cover this distance in less than two weeks.

Make sure that lubricator cup is clean before injecting oil, and see that the oil sinks into hub; then be sure to close lubricator cover afterwards.

The Trigger Control requires a drop of oil occasionally, and just a trace of vaseline should be applied to the guide pulley to maintain easy action.

TOOLS.

One spanner is supplied with every new hub as follows:—

X.44A. This is for the cones and nuts.

For repair use, there is also available:—

DD.5978. Driver Holder (when fixed in a vice this tool holds the driver whilst sprocket is removed).

DD.9128. Sprocket Chain Wrench (for turning sprocket in above operation).

TRIGGER CONTROL.

The control is always carefully adjusted on every completely assembled bicycle leaving the factory, but as it may become deranged in transit we suggest that before delivery to customer, the control is checked to make sure the following points are in order.

1. The cable should be so arranged that acute angles do not occur at any point. Check specially at point where it leaves control casing and at the fulcrum clip. Acute angles will cause undue wear and eventual fraying of strands and impede smooth gear change.
2. There must be ample slack in the outer casing to allow for full steering movement without strain and the stranded steel inner wire must not foul on the frame throughout its length.

GENERAL MAINTENANCE.

The cable ferrule is fixed in control casing and should never be detached. If this is loose it will allow the inner wire to bend at this point, and it may result in fraying the wire.

The lower rivet in control casing should not be moved except when new pawl is required nor must the upper rivet be disturbed except to fit new lever or ratchet plate.

LUBRICATION.

An occasional drop of oil on moving parts is necessary to maintain easy action of the control. Over-oiling is undesirable as surplus oil attracts dirt and grit. Occasionally detach cable and wire from fulcrum clip, slip the outer cable back and oil inner wire.

Occasionally apply a trace of vaseline to the pulley bearings.

Should it ever be necessary to replace Pawl Spring or Control Wire proceed as follows:—

TO REMOVE CONTROL WIRE. Fig. 1.

Detach complete control from handlebar.

Pull outer cable clear of ferrule on casing (A).

Pull trigger back until nipple appears at casing cut-away (B).

Pass inner wire through ferrule slots, and push pawl inwards past wire (C). The pawl spring may now be removed (D).

Push inner wire through until enough slack is given to allow nipple to be removed from hole (E).

Withdraw wire complete.

TO REPLACE CONTROL WIRE. Fig. 2.

Pass wire, nipple first, through hole in front of casing and between pawl and ratchet until enough is through to allow nipple to be inserted in ratchet plate. The ratchet plate hole must be opposite cut-away in casing (F).

Pull slack wire back.

Fit pawl spring and push pawl upwards with a small screwdriver, until lever and ratchet plate can be pushed under it (G).

Pull wire taut, pass it through ferrule slot, and push outer cable into ferrule (H). Fix cable stop on top tube at other end of cable.

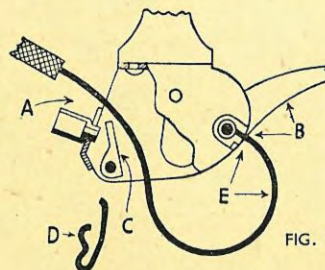


FIG. 1

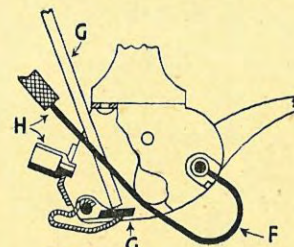
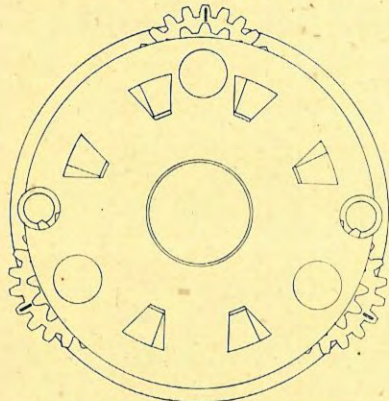


FIG. 2

MAIN ASSEMBLY.

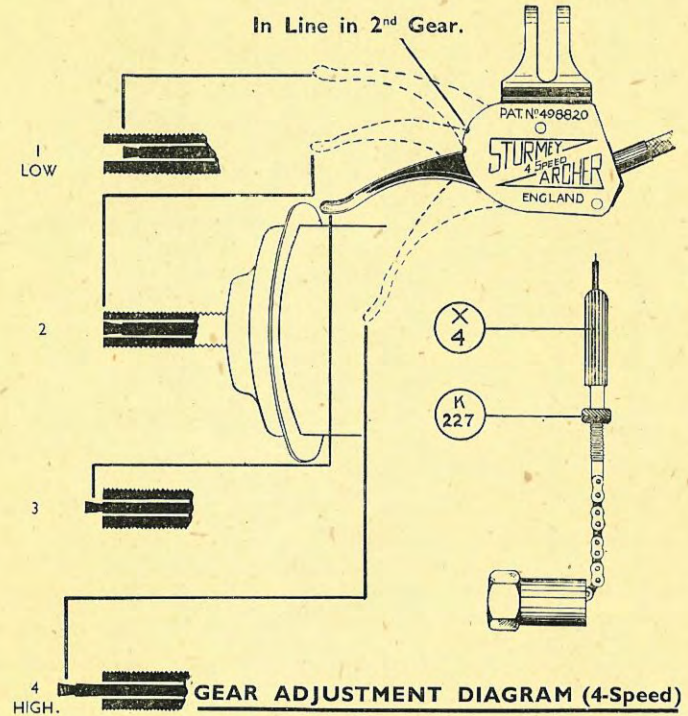
1. L.H. ballcup screwed into shell.
2. Sun pinion spring, large sun pinion, small pinion and sleeve are slid on to the axle and pushed along until dogs engage. Holding them thus, withdraw pinion sleeve until key hole is exposed and insert short key making sure that the cross-hole in the key lines up with the axle hole. The pinions are now released and they will spring back to secure this key. Using the indicator, check that the cross-hole in key is still in alignment with the axle hole. Fit the internally toothed ring so that it engages on the axle square and with the smaller sun pinion, securing it with the washer and nut.
3. Hold axle vertically in vice by flats on L.H. end, and put planet cage in place.
4. The double planet pinions and pins are next fitted so that they engage the two sun pinions; take care that the marked teeth point radially outwards in each case, as shown on drawing.
5. Drop compensator down axle, collar end first and fit clutch sleeve, sliding clutch, key and thrust collar. The notches on the thrust collar must engage the flats on the key.
6. Insert indicator in L.H. end of axle, threading it through the low gear key and compensator spring collar.
7. Insert chain and coupling in R.H. end of axle, threading it through main key and compensator spring.
8. Holding indicator up with a screwdriver in the slot, push coupling down until threads engage and screw together. Feel gently home, but do not use force or the thread may strip. A drag will be felt while screwing, but a distinct stop will be felt when fully screwed up.



CORRECT SETTING OF MARKED TOOTH ON LARGE END OF PLANET PINIONS

Note that only three teeth of the smaller end of the planet show in each case.

9. Fit clutch spring, spring cap, gear-ring, R.H. ball-ring and driver, in that order.
10. The right-hand cone is now fitted by screwing it down finger-tight as far as it will go and then slacking back half a turn. Lock it in this position with the special washer and locknut.
11. The complete gear unit is then inserted in the hub shell and the R.H. ball-ring screwed up tightly.
12. Fit L.H. cone, washer and locknut.



GENERAL NOTES.

1. Keep gear control wire properly adjusted.
2. Change gear smartly and do not hold the pedals still. See instructions under Changing Gear.
3. Do not dismantle hub unless it is essential to do so, but if at any time this has to be done, see that recess in right-hand ball ring, in which outer dust cap revolves, is filled with vaseline or grease when reassembling, as a protection against water entering bearings. Also put a little vaseline or grease in right-hand and left-hand ball races, but see that none gets into the hub, as it may clog the action of the pawls.
4. Check adjustment of left-hand cone occasionally.
5. Pay special attention to lubrication and use only the special oil recommended.
6. It is important that the axle be prevented from rotating in chain stay slots. If the slots are too wide to hold the flats on end of axle, special washers can be supplied to take up play. It is important to keep both axle nuts thoroughly tight; these should be checked regularly to see that they do not shake loose.

GEAR RATIO TABLE FOR WIDE RATIO 4-SPEED HUB. Type FW

No. of Teeth	26" WHEELS				27" WHEELS				28" WHEELS				
	Hub	1 Low	2	3	4 High	1 Low	2	3	4 High	1 Low	2	3	4 High
40	16	43.3	51.3	65.0	82.3	45.0	53.3	67.5	85.4	46.7	55.3	70.0	88.6
	17	40.8	48.3	61.2	77.5	42.3	50.2	63.5	80.4	43.9	52.1	65.9	83.4
	18	38.5	45.7	57.8	73.2	40.0	47.4	60.0	76.0	41.5	49.1	62.2	78.7
	19	36.5	43.2	54.7	69.2	37.9	44.9	56.8	71.9	39.3	46.5	58.9	74.6
	20	34.7	41.1	52.0	65.8	36.0	42.7	54.0	68.4	37.3	44.2	56.0	70.9
	22	31.5	37.4	47.3	59.9	32.7	38.8	49.1	62.2	33.9	40.2	50.9	64.4
	24	28.8	34.2	43.3	54.8	30.0	35.5	45.0	57.0	31.1	36.9	46.7	59.1
42	16	45.5	53.9	68.2	86.3	47.3	56.0	70.9	89.7	49.0	58.1	73.5	93.0
	17	42.4	50.7	64.2	81.3	44.5	52.7	66.7	84.4	46.1	54.6	69.2	87.6
	18	40.5	47.9	60.7	76.8	42.0	49.8	63.0	79.7	43.5	51.6	65.3	82.6
	19	38.3	45.4	57.5	72.8	39.8	47.2	59.7	75.6	41.3	48.9	61.9	78.3
	20	36.4	43.1	54.6	69.1	37.8	44.8	56.7	71.8	39.2	46.4	58.8	74.4
	22	33.1	39.4	49.7	62.9	34.3	40.6	51.5	65.2	35.7	42.3	53.5	67.7
	24	30.3	35.9	45.5	57.6	31.5	37.4	47.3	59.9	32.7	38.7	49.0	62.0
44	16	47.7	56.5	71.5	90.5	49.5	58.6	74.2	93.9	51.3	60.8	77.0	97.5
	17	44.9	53.2	67.3	85.2	46.6	55.2	69.9	88.4	48.3	57.3	72.5	91.8
	18	42.4	50.2	63.6	80.5	44.0	52.1	66.0	83.5	45.6	54.0	68.4	86.6
	19	40.1	47.6	60.2	76.2	41.7	49.4	62.5	79.1	43.2	51.2	64.8	82.0
	20	38.1	45.2	57.2	72.4	39.6	46.9	59.4	75.2	41.1	48.6	61.6	78.0
	22	34.7	41.1	52.0	65.8	36.0	42.7	54.0	68.4	37.3	44.2	56.0	70.9
	24	31.7	37.6	47.6	60.2	33.0	39.1	49.5	62.6	34.2	40.5	51.3	64.9
46	16	49.8	59.0	74.7	94.5	51.7	61.3	77.6	98.2	53.7	63.6	80.5	101.9
	17	46.9	55.5	70.3	89.0	48.7	57.7	73.0	92.4	50.5	59.9	75.8	95.9
	18	44.3	52.5	66.4	84.0	46.0	54.5	69.0	87.3	47.7	56.5	71.5	90.5
	19	41.9	49.7	62.9	79.6	43.6	51.7	65.4	82.8	45.2	53.6	67.8	85.8
	20	39.9	47.2	59.8	75.7	41.4	49.1	62.1	78.6	42.9	50.9	64.4	81.5
	22	36.3	43.1	54.5	69.0	37.7	44.6	56.5	71.5	39.1	46.3	58.6	74.2
	24	33.2	39.3	49.8	63.0	34.5	40.9	51.8	65.6	35.8	42.4	53.7	68.0
48	16	52.0	61.6	78.0	98.7	54.0	64.0	81.0	102.5	56.0	66.4	84.0	106.3
	17	49.0	58.0	73.5	93.0	50.8	60.2	76.2	96.4	52.7	62.5	79.1	100.2
	18	46.2	54.7	69.3	87.7	48.0	56.9	72.0	91.1	49.8	59.0	74.7	94.6
	19	43.8	51.9	65.7	83.2	45.5	53.9	68.2	86.3	47.1	55.8	70.7	89.5
	20	41.6	49.3	62.4	79.0	43.2	51.2	64.8	82.0	44.8	53.1	67.2	85.0
	22	37.8	44.8	56.7	71.8	39.3	46.6	58.9	74.5	40.7	48.3	61.1	77.3
	24	34.8	41.1	52.0	65.8	36.0	42.7	54.0	68.4	37.3	44.2	56.0	70.9
50	16	54.2	64.2	81.3	103.0	56.3	66.7	84.4	106.9	58.3	69.1	87.5	110.8
	17	51.0	60.4	76.5	96.8	52.9	62.7	79.4	100.5	54.9	65.1	82.4	104.3
	18	48.1	57.0	72.2	91.4	50.0	59.3	75.0	94.9	51.9	61.5	77.8	98.5
	19	45.6	54.0	68.4	86.6	47.4	56.2	71.1	90.0	49.1	58.2	73.7	93.3
	20	43.3	51.3	65.0	82.3	45.0	53.3	67.5	85.4	46.7	55.3	70.0	88.6
	22	39.4	46.7	59.1	74.8	40.9	48.5	61.4	77.7	42.4	50.2	63.6	80.5
	24	36.1	42.8	54.2	68.6	37.5	44.4	56.2	71.2	38.9	46.1	58.3	73.8

DISMANTLING.

This hub is very similar to the AM. three-speed but differs from it in the axle assembly. To dismantle, the procedure is:—

1. Remove L.H. locknut and cone.
2. Unscrew R.H. ball-ring and withdraw gear unit from shell.
3. Holding L.H. end of axle in vice, remove R.H. locknut, cone lock-washer and cone.
4. The clutch spring, driver, ball-ring and gear-ring can now be lifted off in that order.
5. Push out pinion pins and remove pinions.
6. Holding the indicator against rotation, unscrew and remove chain and indicator coupling and indicator.
7. The thrust ring is then removed and the axle key pushed out, so allowing the clutch sleeve, sliding clutch and planet cage to be removed.
8. The internal compensating spring complete with collar can now be taken out of the R.H. end of the axle.
9. Remove nut and washer holding the internally toothed ring and remove this ring from the axle.
10. By pushing the two sun pinions along so that the large one engages the axle dogs, the sleeve under the small one should be moved in the opposite direction to expose the second axle key which can now be pushed out.
11. The two sun pinions, sleeve and spring can then be slid off, so completing the dismantling.
12. The L.H. ballcup can be unscrewed from the hub shell if necessary. It has a L.H. thread.

Pawls, ballcages, etc., are the same as the AW, in operation.

ASSEMBLING.

The following sub-assemblies should be prepared first.

1. Pawls, pins and springs in gear-ring.
2. Pawls, pins and springs in planet cage.
3. Ballcages and dust-caps in driver and L.H. ballcup if they have been removed.
4. Balls and retainer in R.H. ball-ring.
5. IMPORTANT. Small collar pushed into end of compensator spring. This must be a tight fit.