

## COMPLETE WHEEL-BUILDING INSTRUCTIONS

*NOTE:*— Before using this book and for the correct crossing of spokes for both hub flanges of each individual wheel, please refer to the latest Spoke Length Chart. (Instructions for building Radial Spoked wheels are not included in this book.)

*NOTE:*— In the case of BF., BR. and Front Dynohubs the large hub flange must be called 'A' and the small hub flange be called 'B'. On AB., AG. and FG. Hubs, the *small* hub flange must be called 'A' and the *large* hub flange be called 'B'. On standard 3-speed Hubs and ordinary front and rear Hubs, which hub flange is referred to as 'A' or 'B' is immaterial.

*NOTE:— Read the notes carefully and follow instructions to the letter.*

**Colour Code for Spokes shown in Diagrams.  
(PART 1 ONLY)**

-  Represents INSIDE Spoke from hub flange 'A'
-  Represents OUTSIDE Spoke from hub flange 'A'
-  Represents INSIDE Spoke from hub flange 'B'
-  Represents OUTSIDE Spoke from hub flange 'B'

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## Part I. WHEEL-BUILDING

1. *This applies to:* — **ALL TYPES OF WHEELS**

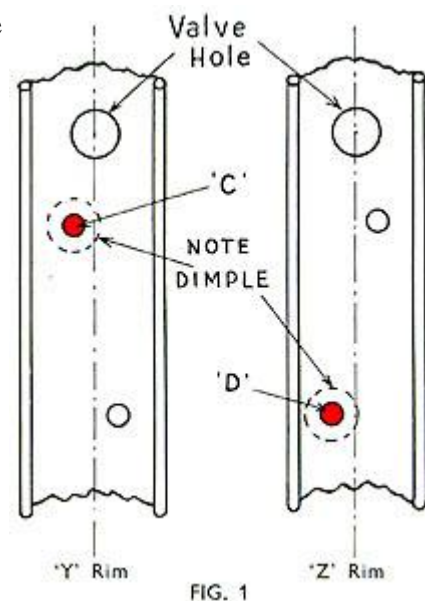
Examine Rim (where rim tape fits) for position of valve hole relative to the first and second spoke holes, noting the holes on the left, 'C' or 'D'.

(In the case of dimpled rims care must be taken to hold the Rim in position so that holes 'C' or 'D' are dimpled).

Rim with hole 'C' = 'Y' Rim.

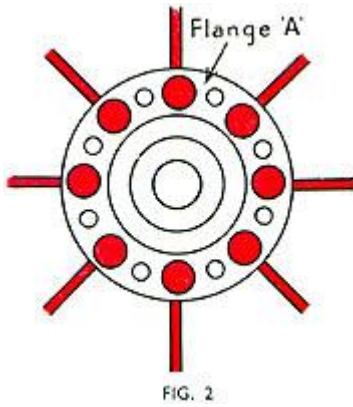
Rim with hole 'D' = 'Z' Rim.

(See Fig. 1.)



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2. *This applies to:* — **ALL WHEELS SPOKED CROSS 3 AND 4, EXCEPT FRONT DYNOHUBS, BF. AND BR. HUBS**



Insert through hub flange 'A', from the outside, eight spokes (for 32-spoke wheel) or ten spokes (for a 40-spoke wheel), through alternate holes, leaving spoke HEADS showing on outside of hub flange 'A'. (See Fig. ◆2.)

FIG. 2

3. This applies to: — **FRONT DYNOHUBS, BF. AND BR. HUBS**

(3a) For a 'Y' Rim cross two spokes or a 'Z' Rim cross three spokes on hub flange 'A'.

Find a hole in hub flange 'A' which is in line with a slotted hole in hub flange 'B' (See Fig. ◆3.), and insert a spoke from the outside through hub flange 'A' in line with this slotted hole in hub flange 'B', then insert remaining seven spokes in alternate holes in hub flange 'A'.

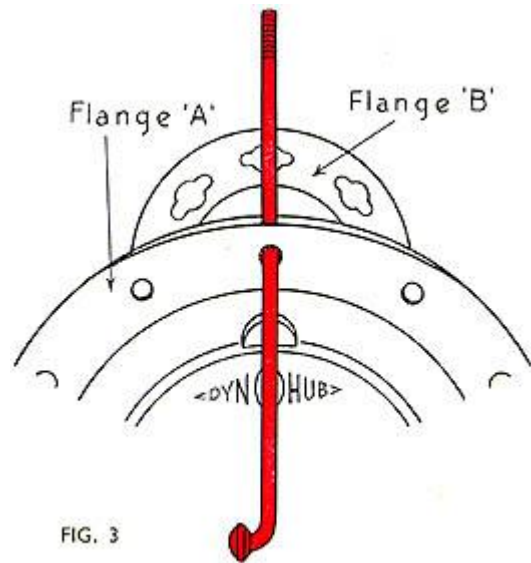


FIG. 3

NOTE:—Large hub flange must be called 'A'.

(3b) For a 'Z' Rim cross two spokes or a 'Y' Rim cross three spokes on hub flange 'A'.

Find a hole in hub flange 'A' which is centrally situated between two slotted holes in hub flange 'B' (See Fig. ◆4.), and insert a spoke from the outside through this hole in hub flange 'A', then insert the remaining seven spokes in alternate holes in hub flange 'A'.

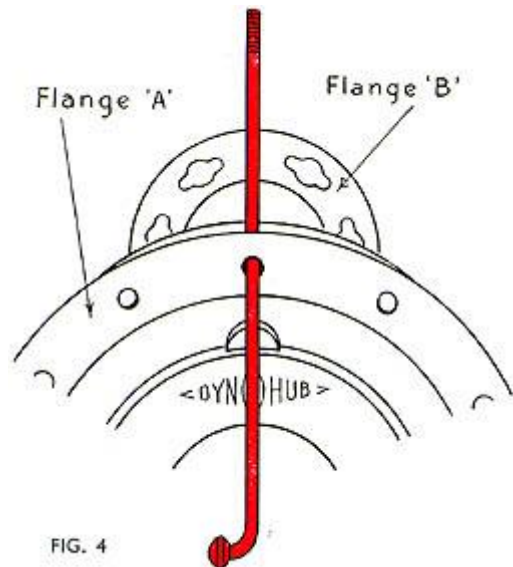
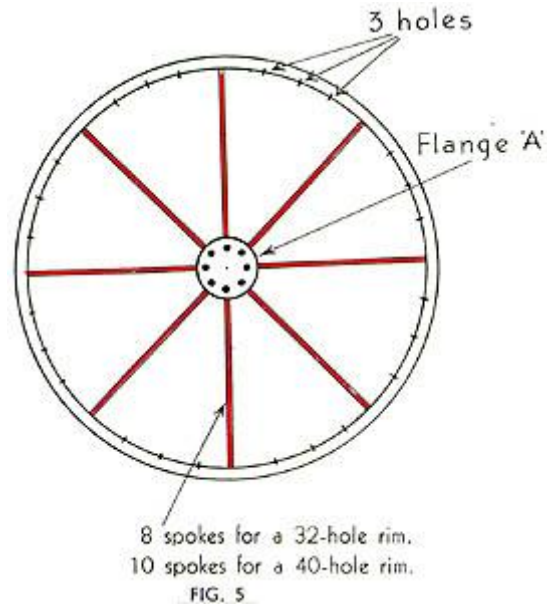


FIG. 4

NOTE:—Large hub flange must be called 'A'.

4. This applies to: — **ALL WHEELS**



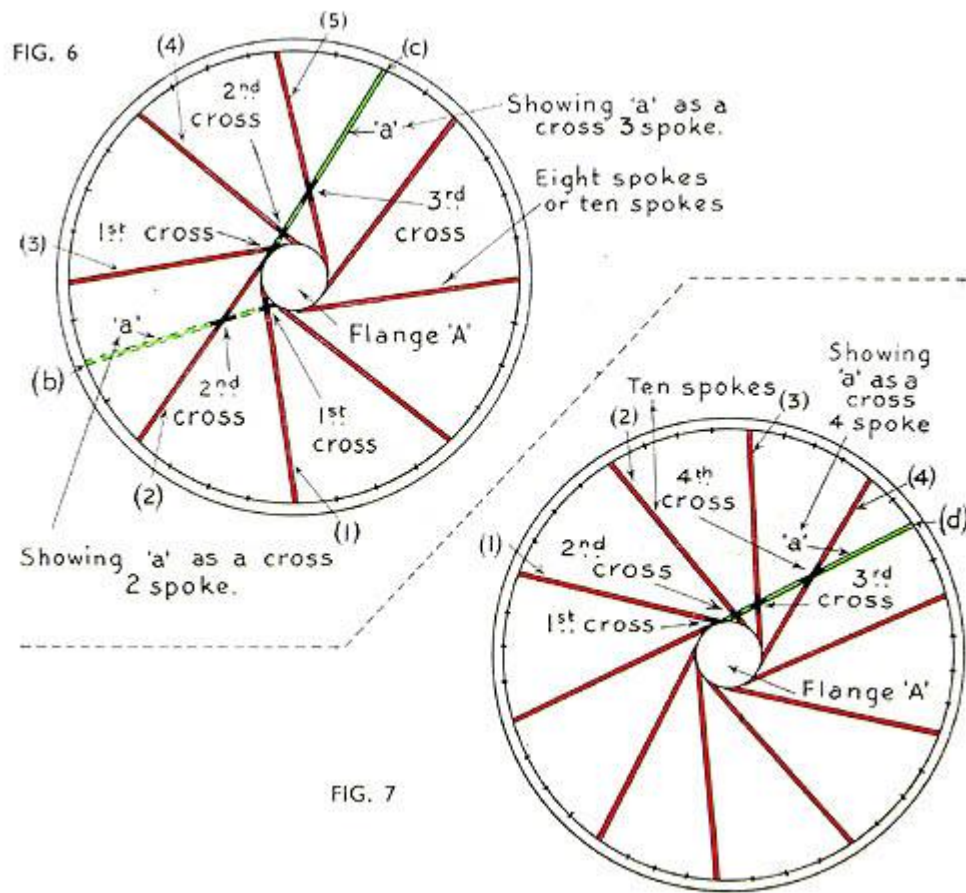
Insert any one of the eight spokes already fitted in hub flange, through rim hole 'C' for a 'Y' Rim or rim hole 'D' for a 'Z' Rim, taking care to keep hub flange 'A' on the same side as hole 'C' or 'D' respectively (Fig. 2), and loosely screw on nipple after fitting rim washer (if necessary).

*NOTE:*— (1) Do not screw nipples on too far or difficulty will be experienced at a later stage of assembly. (2) Rim washer is generally used on Westwood and Beaded Edge Rims only.

Insert remainder of spokes into the holes in the Rim, missing three holes in Rim between each spoke and loosely screw on nipples after fitting rim washers (if necessary). This applies to 32-hole Rims and 40-hole Rims.

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5. This applies to: — **ALL WHEELS EXCEPT FRONT DYNOHUBS, BF. AND BR. HUBS**



Insert one spoke 'a' from inside of hub flange 'A' and cross the spoke clockwise over spokes Nos.—

(1) and (2) for cross 2, or (3), (4) and (5) for cross 3 (See Fig. 6.), or (1), (2), (3) and (4) for cross 4 (See Fig. 7.).

*NOTE:*— 32-spoke wheel is crossed two or three times (See Fig. 6.), 40-spoke wheel is crossed three or four times (See Fig. 7.), referring to Spoke Length Chart in each case.

Then insert spoke 'a' through hole 'b' in Rim for cross two spokes, hole 'c' for cross three spokes (See Fig. 6.), or hole 'd' for cross four spokes (See Fig. 7.), missing one spoke hole in Rim either side of spoke 'a', fit rim washer (if necessary) and loosely screw on nipple.

6. This applies to: — **FRONT DYNOHUBS, BF. AND BR. HUBS**

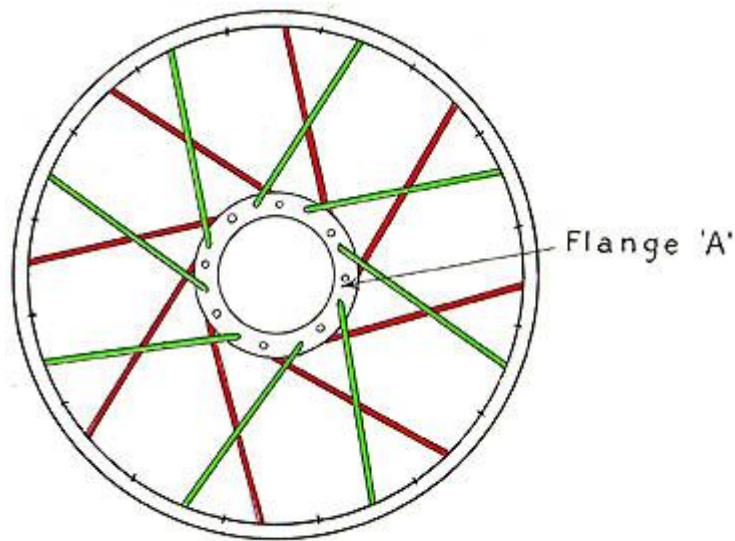


FIG. 8

Turn wheel over and insert the remaining eight spokes from inside hub flange 'A'. Now turn wheel back to its former position and crossing these spokes clockwise, over two spokes already fitted in Rim, for cross 2 (See Fig. 8.), or over three spokes already fitted in Rim for cross 3 (not illustrated), insert them in the holes in the Rim, missing one hole between each spoke.

7. This applies to: — **ALL WHEELS SPOKED CROSS 3 AND 4, EXCEPT FRONT DYNOHUBS, BF. AND BR. HUBS**

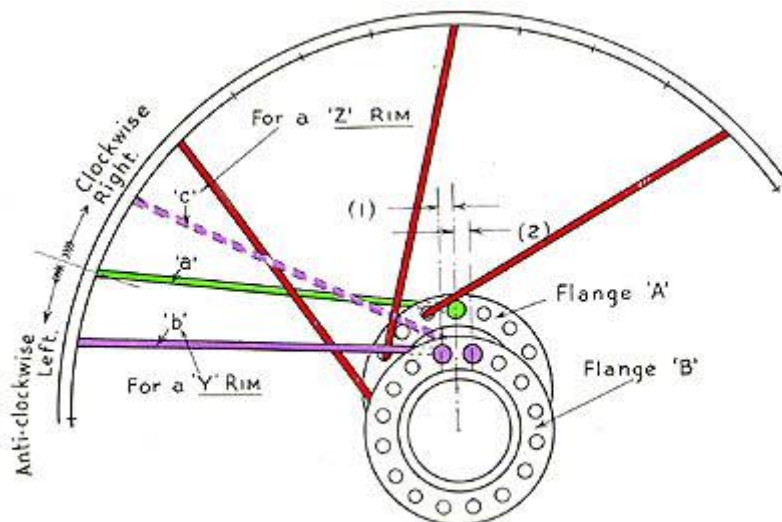


FIG. 9

**(7a) for a 'Y' Rim.**

Turn the now partly-assembled wheel over, keeping the as yet unused hub flange 'B' uppermost, and insert the first spoke 'b' from the outside of hub flange 'B' anti-clockwise to the spoke 'a' HEAD on hub flange 'A' (See 1 on Fig. 9.), then insert this spoke 'b' in the hole in the Rim to the left (anti-clockwise), one hole below the outside spoke 'a' on hub flange 'A',

fit rim washer (if necessary) and loosely screw on spoke nipple.

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**(7b) for a 'Z' Rim.**

Turn the now partly-assembled wheel over, keeping the as yet unused hub flange 'B' uppermost, and insert the first spoke 'c' from the outside of hub flange 'B' clockwise to the spoke 'a' HEAD on hub flange 'A' (See 2 on Fig. 9.), then insert this spoke 'c' in the Rim to the right (clockwise), one hole above the outside spoke 'a' on hub flange 'A', fit rim washer (if necessary) and loosely screw on spoke nipple.

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**8. This applies to: — FRONT DYNOHUBS, BF. AND BR. HUBS**

Turn wheel over with hub flange 'B' uppermost, then proceed as (8a) or (8b):

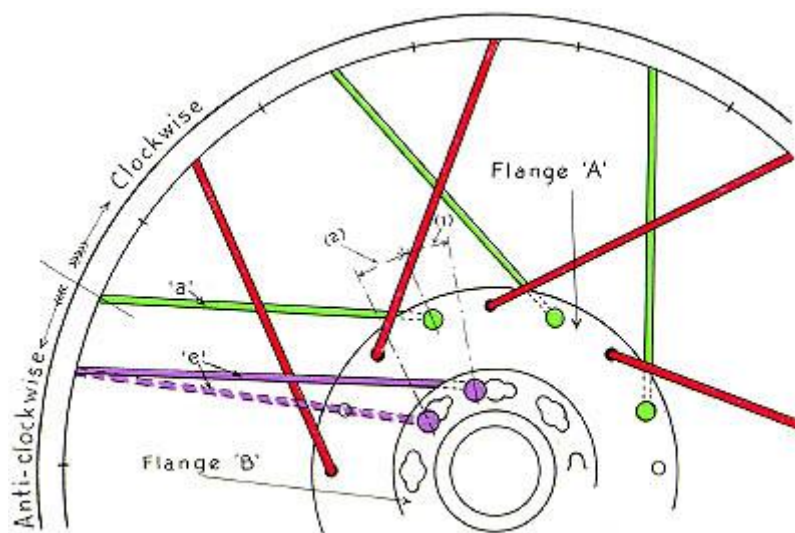


FIG. 10

**(8a) for a 'Y' Rim (cross 2 or 3 on hub flange 'A').**

Take a spoke 'e' and loosely screw on nipple, also fit rim washer (if necessary) and insert the spoke 'e' HEAD through the hole in Rim, one hole anti-clockwise to spoke 'a' (i.e. to the left of spoke 'a') and through a slotted spoke hole in hub flange 'B' from the inside (spoke 'e' HEAD to show outside hub flange 'B') to the right (clockwise) of spoke 'a' HEAD in the hub flange 'A' (See 1 on Fig. 10.), for a wheel cross 2 on hub flange 'A', or to the left (anti-clockwise) of spoke 'a' HEAD in hub flange 'A' (See 2 on Fig. 10.), for a wheel cross 3 on hub flange 'A'.

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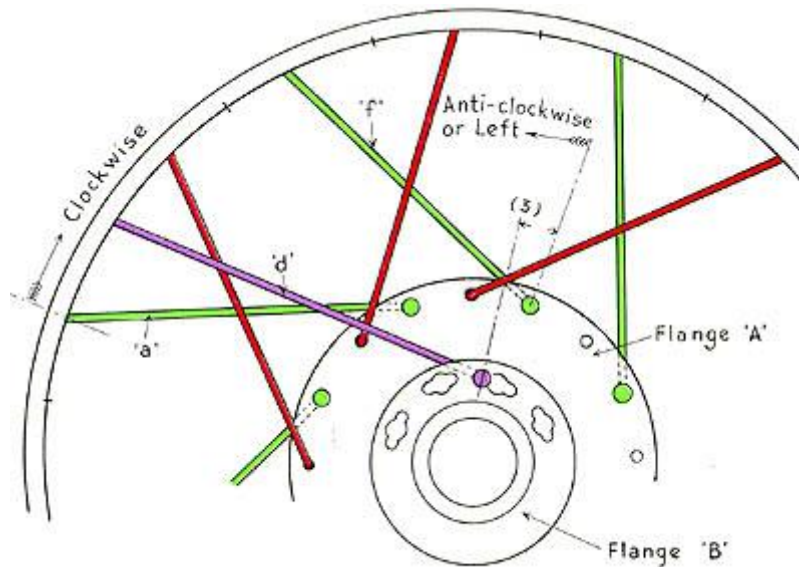


FIG. 11

**(8b) for a 'Z' Rim (cross 2 or 3 on hub flange 'A').**

Take a spoke 'd' and loosely screw on nipple, also fit rim washer (if necessary) and insert spoke 'd' HEAD in hole in Rim, one hole clockwise to spoke 'a' (i.e. to the right of spoke 'a') and through slotted spoke hole in hub flange 'B', from the inside (spoke 'd' HEAD to show outside hub flange 'B') to the left (anti-clockwise) of spoke 'f' HEAD in the hub flange 'A' (See 3 on Fig. 11.)

These instructions apply equally to Wheels Cross 2 or Cross 3 on flange 'A'.

**9. This applies to: — FRONT DYNOHUBS, BF. AND BR. HUBS**

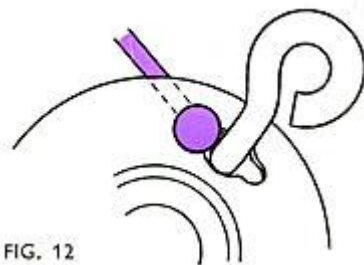


FIG. 12

Now insert the remaining 'e' spokes (Fig. 10) or 'd' spokes (Fig. 11) by loosely screwing on each spoke a nipple, also a rim washer (if necessary), and threading them through the holes in the Rim, missing three holes between each spoke (counting spokes already fitted in Rim as holes), starting from 'e' (Fig. 10) or 'd' (Fig. 11) as the case may be, depending on pattern of Rim. The use of a peg is advisable as shown in Fig. 12; this prevents spokes from falling out immediately

they have been fitted.

**10. This applies to: — FRONT DYNOHUBS, BF. AND BR. HUBS**

Now to insert the remaining spokes in hub flange 'B', proceed as follows: take eight spokes and loosely screw on nipples, fit rim washers (if necessary), and thread these spokes by the HEAD, through the holes in the Rim, and, crossing over (in the opposite direction) three inside spokes ('e' on Fig. 10) or ('d' on Fig. 11), insert the spoke HEADS through slotted holes in hub flange 'B' from the outside, the spoke HEADS being on the inside of hub flange 'B'. To keep the spokes from falling out use pegs as shown in Fig. 12. These can be withdrawn immediately the spokes are tensioned in the truing operation. These wheels are ready for truing.

**11. This applies to: — ALL WHEELS SPOKED CROSS 3 AND 4 EXCEPT FRONT**



## DYNOHUBS, BF. AND BR. HUBS

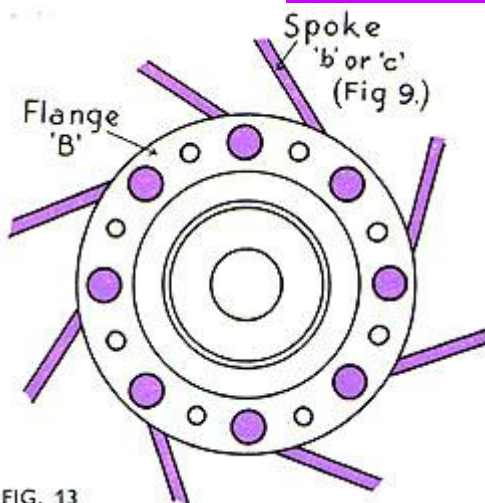


FIG. 13

Now insert from the outside the seven remaining spokes (for a 32-spoke wheel) or nine spokes (for a 40-spoke wheel) in hub flange 'B' in alternate holes, starting at spoke 'b' or 'c' in Fig. 9. Then insert these spokes in the holes in the Rim, and, counting from spokes 'b' or 'c' (Fig. 9) missing three holes between each spoke, taking into account the spoke holes in rim already fitted with spokes from hub flange 'A'. Fit rim washers (where necessary) and loosely screw a nipple on each spoke.

### 12. This applies to: — **ALL WHEELS SPOKED CROSS 3 AND 4 EXCEPT FRONT DYNOHUBS, BF. AND BR. HUBS**

Insert the remaining spokes into hub flange 'A' from the inside, now turn the wheel over to its former position and starting from spoke 'a' (Fig. 14) insert these spokes into the holes in the Rim, missing three holes (counting holes already fitted with spokes) between each spoke, fit rim washers (if necessary) and loosely screw nipple on each spoke.

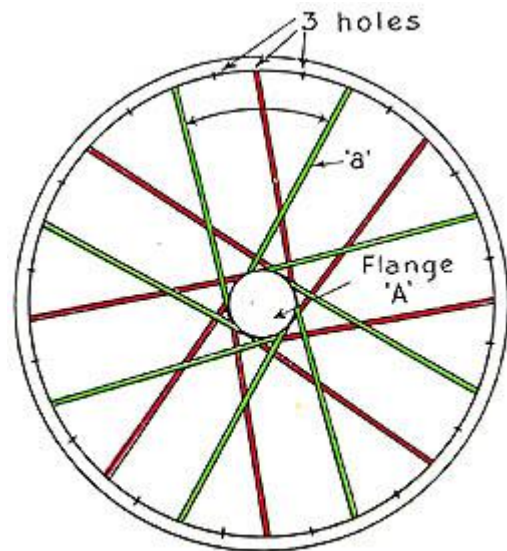


FIG. 14

### 13. This applies to: — **ALL WHEELS SPOKED CROSS 3 AND 4 EXCEPT FRONT DYNOHUBS, BF. AND BR. HUBS**

Now insert the remaining spokes from the inside into hub flange 'B' and, turning the wheel over, complete the building by inserting these spokes into the vacant holes in the Rim, crossing over three or four spokes (as the case may be) in the opposite direction to those already fitted in position from the same hub flange 'B'. Fit rim washers (if necessary) and loosely screw a nipple on each spoke. These wheels are now ready for truing.

## Part II. WHEEL-TRUEING

### 1. This applies to: — **ALL TYPES OF WHEELS**

Tighten the spokes with the aid of a Spoke Nipple Key, until they are all of equal tension.

This is done by bringing all spokes into similar positions in each nipple.

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2. *This applies to:* — **ALL OFF-CENTRE WHEELS, i.e., WHEELS WITH FRONT DYNOHUBS, BF., BR., AB., AG., FG. AND 3-SPEED HUBS**

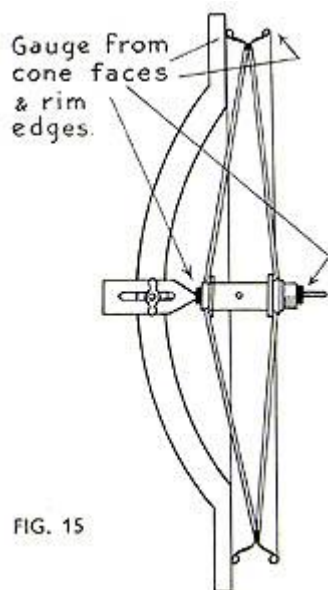


FIG. 15

It is advisable to gauge above wheels for central alignment prior to truing; a Central Alignment Gauge as shown in Fig. 15 will be required.

Adjust by tightening all spokes on the side which is indicated as being in error, or loosening opposite side as tension allows.

*NOTE:*—The faces of cones and edges of rim are gauging points.

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3. *This applies to:* — **ALL TYPES OF WHEELS**

Fit the wheel in a Truing Stand and check wheel for play in the cones. If any play is apparent, adjust cones until this is removed, but the wheel must spin freely.

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4. *This applies to:* — **ALL TYPES OF WHEELS**

On spinning the wheel, vagaries of the rim on either side and up and down diametrically will be perceived. The side movements must be corrected first; judge by eyesight which is the biggest error and indicate this by holding a piece of chalk alongside the rim (supporting the hand on the Truing Stand), and, swinging the rim, so marking the bad portion. To correct this error, tighten *half a turn* or more, the nipple or nipples on spokes from hub flange on opposite side to which is indicated by chalk mark and loosen (as tension allows) the nipple or nipples on spokes from nearest flange to which is indicated. Repeat on either side of rim until all side movement of rim is removed.

*NOTE:*—As side movement becomes less, adjustment of the nipple or nipples must be reduced accordingly.

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5. *This applies to:* — **ALL TYPES OF WHEELS**

The next step is to correct the diametrical up and down movement. Indicate this by chalking the outside edges, similar to operation 4; if the chalk mark indicates an even number of spokes as being in error, tighten by one turn (more or less) the nipples as indicated by chalk. If the chalk indicates an odd number of spokes as being in error, tighten by one turn (more or less) the centre spoke or spokes and the two outside spokes by approximately half the above amount. After this operation re-check as paragraph 4.

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6. *This applies to:* — **ALL TYPES OF WHEELS**

Now check the inside diameter movement by chalk indication on the brake track or flat face of rim. As the chalk mark indicates the spokes in error, reverse operations in paragraphs 4 and 5 above by loosening the spokes. After this operation re-check as paragraph 4.

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7. *This applies to:* — **ALL TYPES OF WHEELS**

The wheel must now be re-checked for central alignment; use the Central Alignment Gauge, Fig. 15. If wheel is out at all, re-check as operation in paragraph 2, and subsequent operations for finality, so completing what should be a perfect wheel.

*NOTE:*—If the spokes protrude through the nipples it will be necessary to grind these down, leaving a smooth surface on the nipple top.

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Ref. AD4935 ◆◆◆◆◆◆◆◆ Printed in England by Moonfleet Press Ltd.,  
Leicester