

# MATCHLESS MOTOR-CYCLES

ALL Matchless motor-cycles, for some years now, have been fitted with engines of Matchless design and manufacture. With but one exception (Model B, 1931) all flywheel-axle bearings are plain on the timing side and roller on the driving side. All crankpin big-end bearings are of the roller type, and all gudgeon-pin and camshaft bearings are of the plain type.

## Replacing the Driving-side Main Bearing

The driving-side flywheel-axle bearing consists of the axle, a set of rollers, double row, set in a bronze cage and a hardened steel outer race. The outer race is pressed into the crankcase. If the outside of the crankcase is examined, three holes will be noticed in the boss carrying the outer race. Three metal pins (three stout french nails with the points and heads cut off will serve) must be placed in the three holes, and upon

pressure being applied to the pins the race will be removed from its housing. Fig. 1 shows how this may be done.

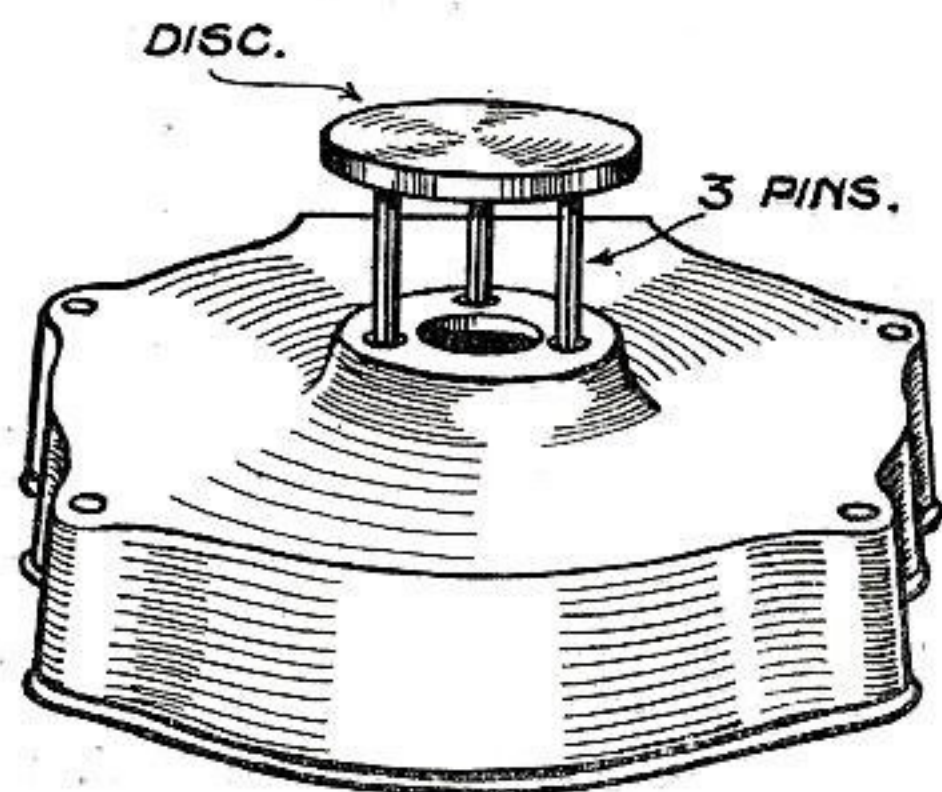


Fig. 1.—REMOVING THE DRIVING-SIDE MAIN BEARING.

Place three stout nails with the points cut off in the holes in the crankcase boss. Place a hardwood disk over the nails. The race can then be driven out by steady blows on the disk.

The disk can be of metal or hardwood, and the "pressure" can take the form of steady blows with a mallet. The crankcase half should bear on a level surface. The new race merely requires pressing into the crankcase. This operation can be performed by using a piece of hardwood and a mallet, but care must be taken to see that the race does not tilt when fitting it.

## And the Timing Side

The timing-side flywheel-axle bearing is a plain bronze bush, that, in some models, has a flange

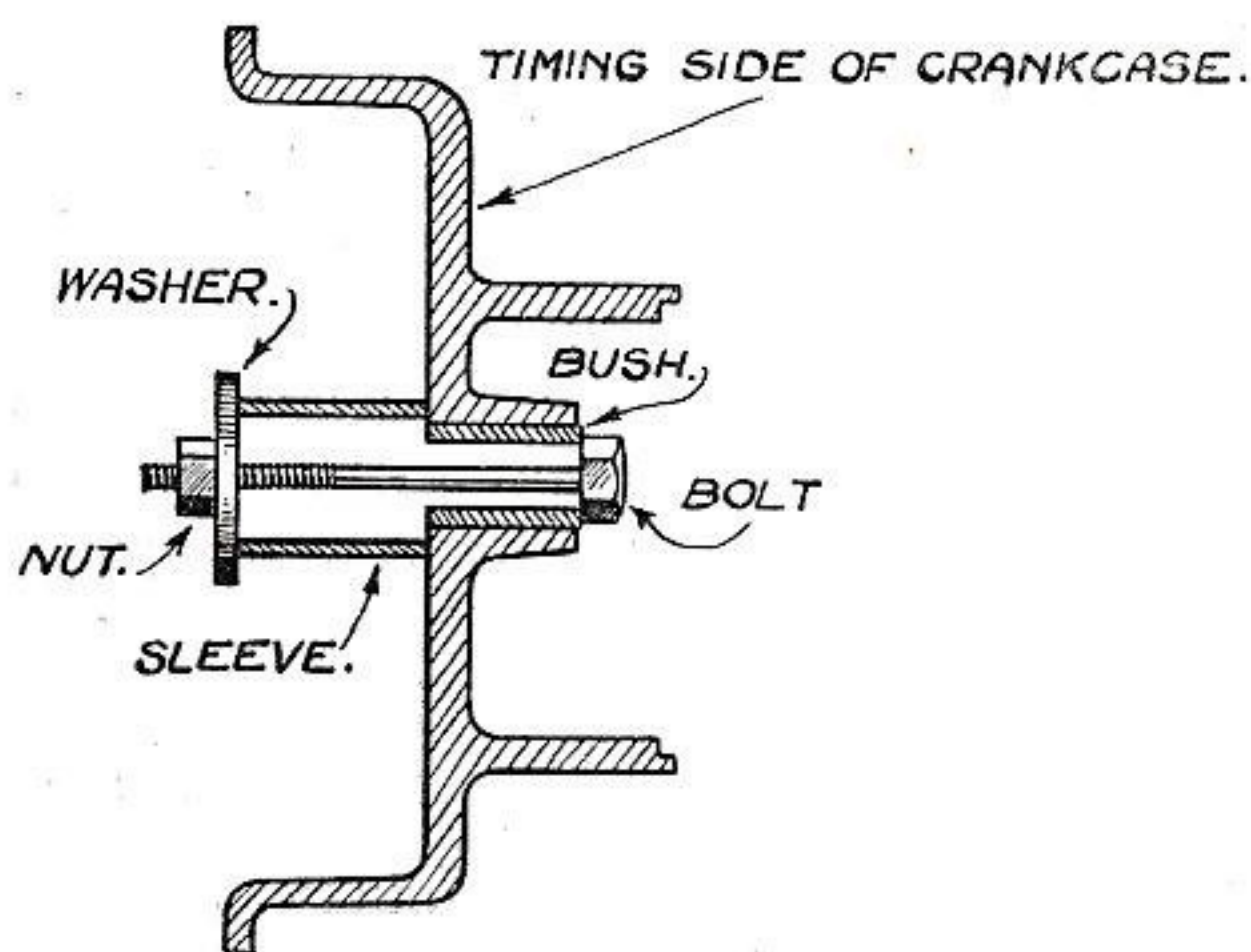
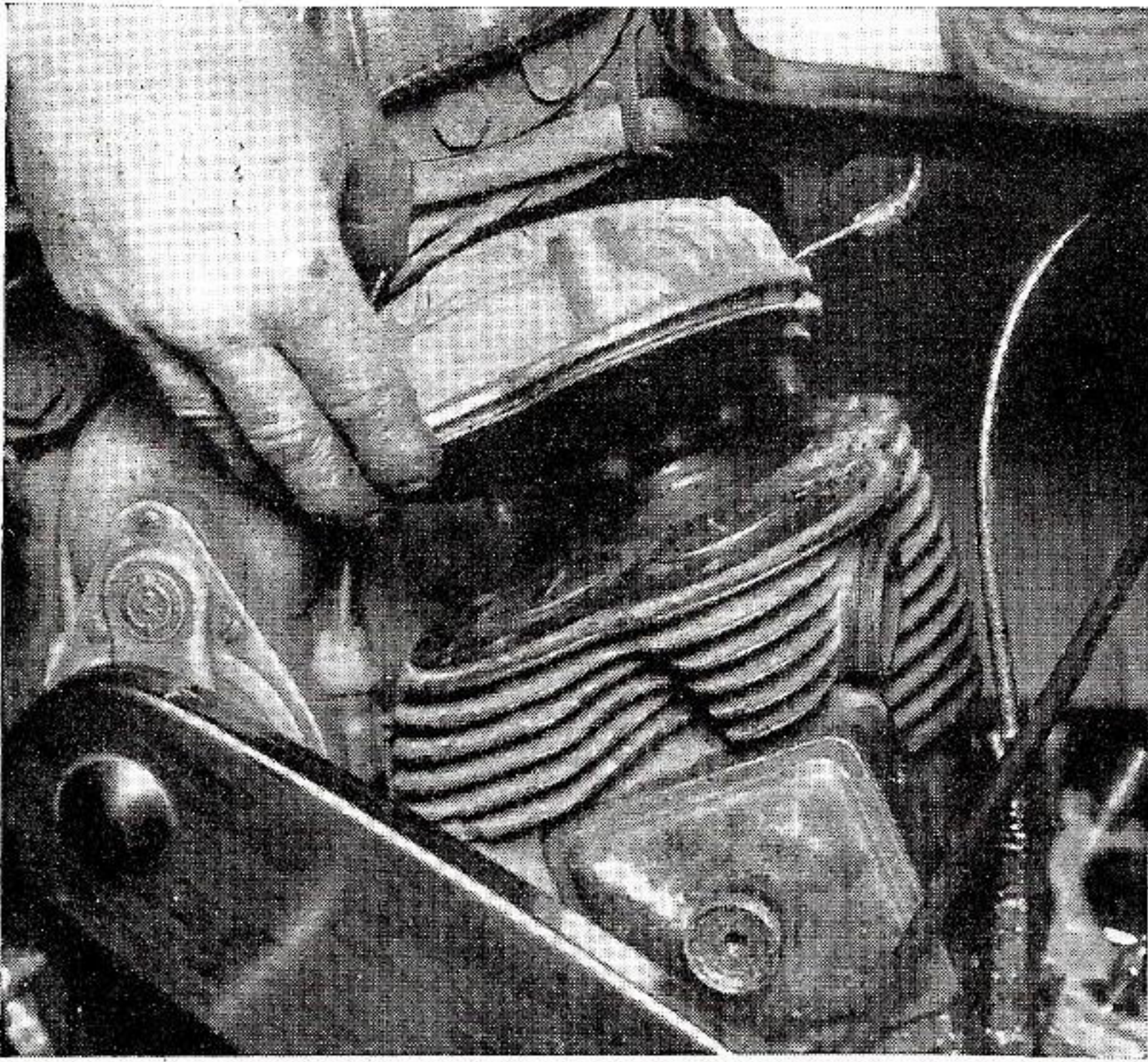


Fig. 2.—REMOVING THE TIMING-SIDE MAIN BEARING.

Use a bolt sleeve washer and nut for this purpose as shown above.



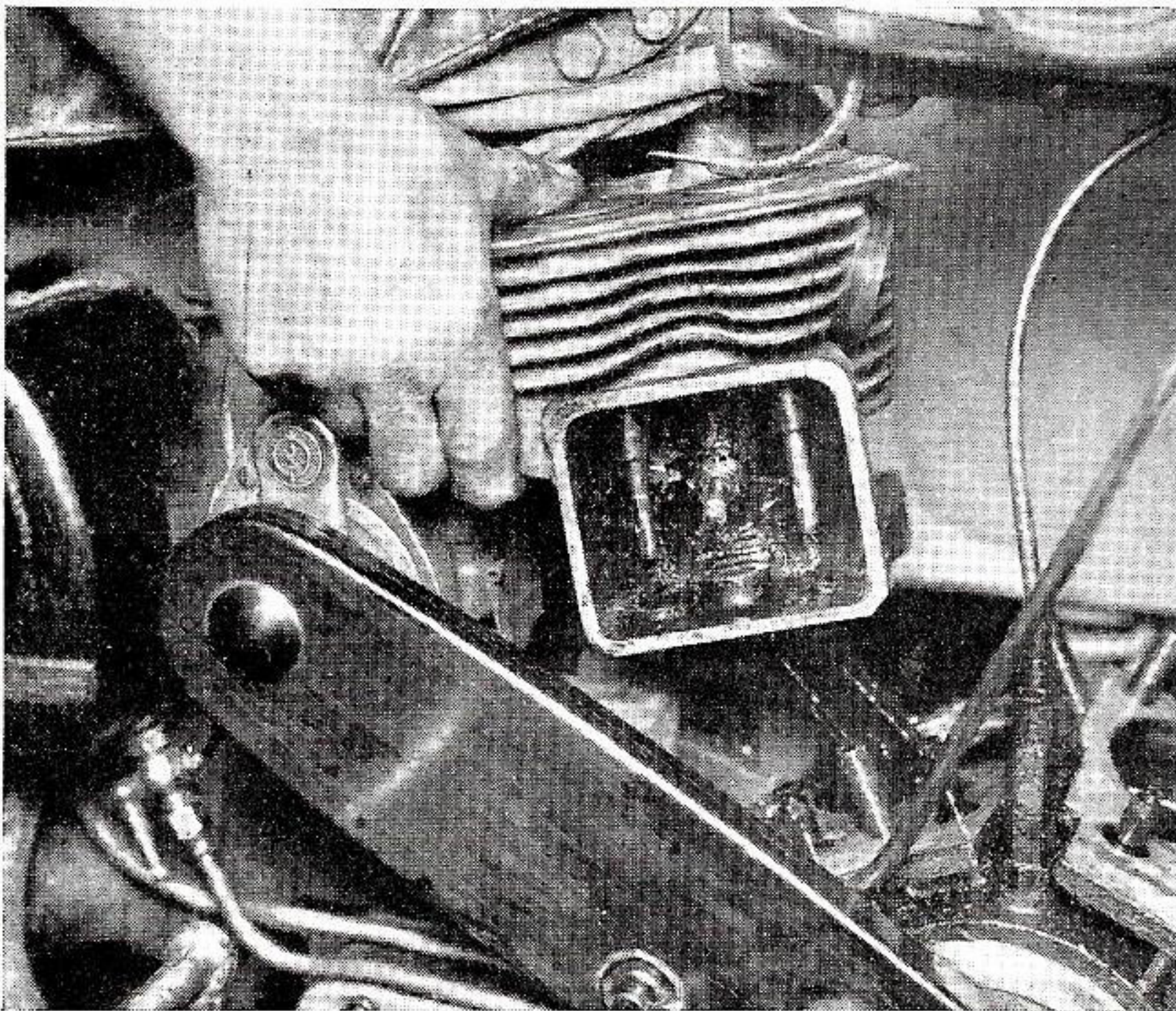
**Fig 2 REMOVING S.V. CYLINDER HEAD.**

Unscrew the bolts retaining the head to the cylinder. If these bolts show a tendency to stick the engine should be allowed to run till it is warm and then a little paraffin placed around each bolt.

on the "inside" end. The old bush can be removed by using a bolt, sleeve, washer, and nut as shown in Fig. 2. The head of the bolt should be not larger than the outside diameter of the bush, and the sleeve should be a trifle longer than the bush. On tightening the nut on the bolt the bush will be drawn out. It will be readily seen that by rearranging these parts they may be used to draw the new bush into the crankcase.

## After Rebushing

On those models that have internal oilways, care must be taken to see that the holes in the bush coincide with those in the crankcase. After a plain bush has been fitted in a crankcase it may be necessary to slightly ease the internal bore of the bush by reamering or scraping until the flywheel-axle is a perfectly free fit in it. Do not tolerate any tightness, but when testing for this see



**Fig 3 REMOVAL OF TWIN CYLINDER.**

The induction pipe, carburetter and exhaust pipes must be removed, and each cylinder must be partly rotated before it can be drawn away to clear the piston.

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that the axle is smeared with engine oil.

The method described above can also be used for removing camshaft bushes, bushes for gudgeon pins and valve guides. Blind camshaft bushes must probably be broken or cut in order to extract them and the new bushes fitted by pressure.

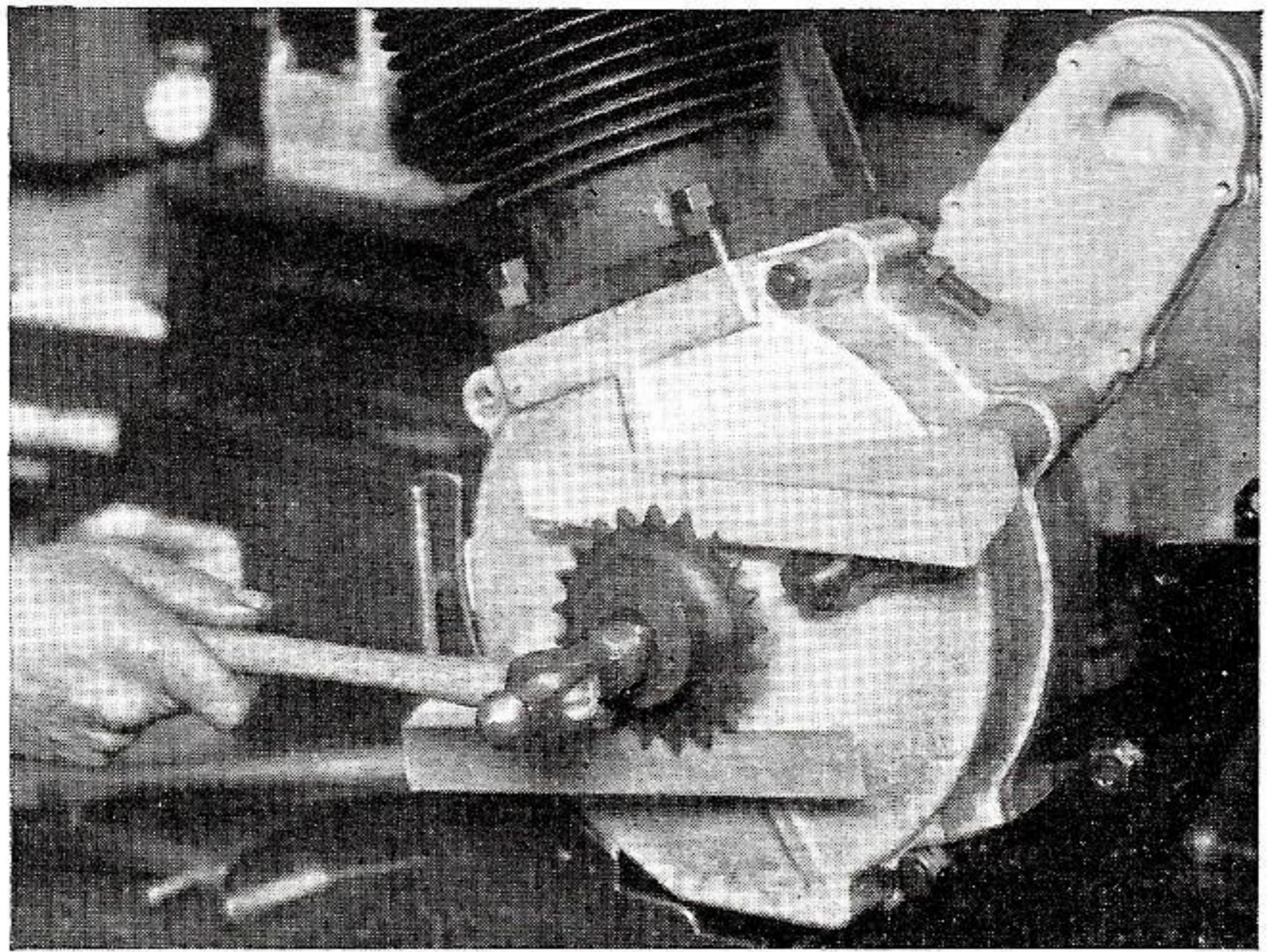
### Removing the Engine from Frame

A complete engine overhaul entails the removal of the engine from the frame. To do this the machine must be raised on both stands, the carburetter, silencer and exhaust pipes taken away, and all oil pipes disconnected. Plug the oil-feed pipe with a piece of wood or rag to prevent oil wastage. Next remove the footrests or footboards, the front chaincase and chain and the magneto chain and case where fitted. The crankcase bolts should then be removed, and this will allow the engine to be taken away from the frame.

## DISMANTLING

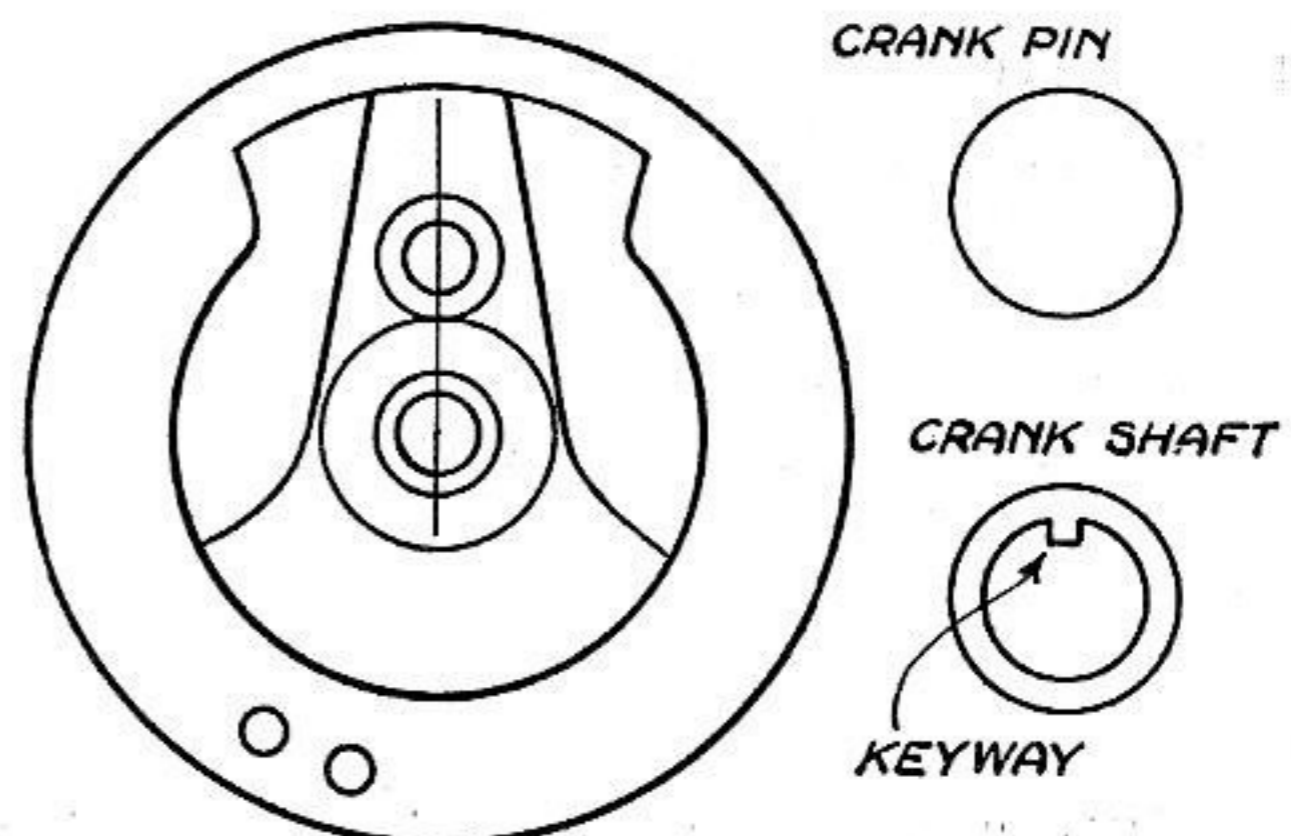
### Cylinder and Valve Tappets

Remove the cylinder as a complete unit. Remove the piston by extracting one of the gudgeon-pin retaining spring rings, and pushing the gudgeon pin out of the piston. This pin is an easy sliding fit, and no tools should be necessary to remove it. Then remove the timing-gear cover. Lift the tappets out of the guides.

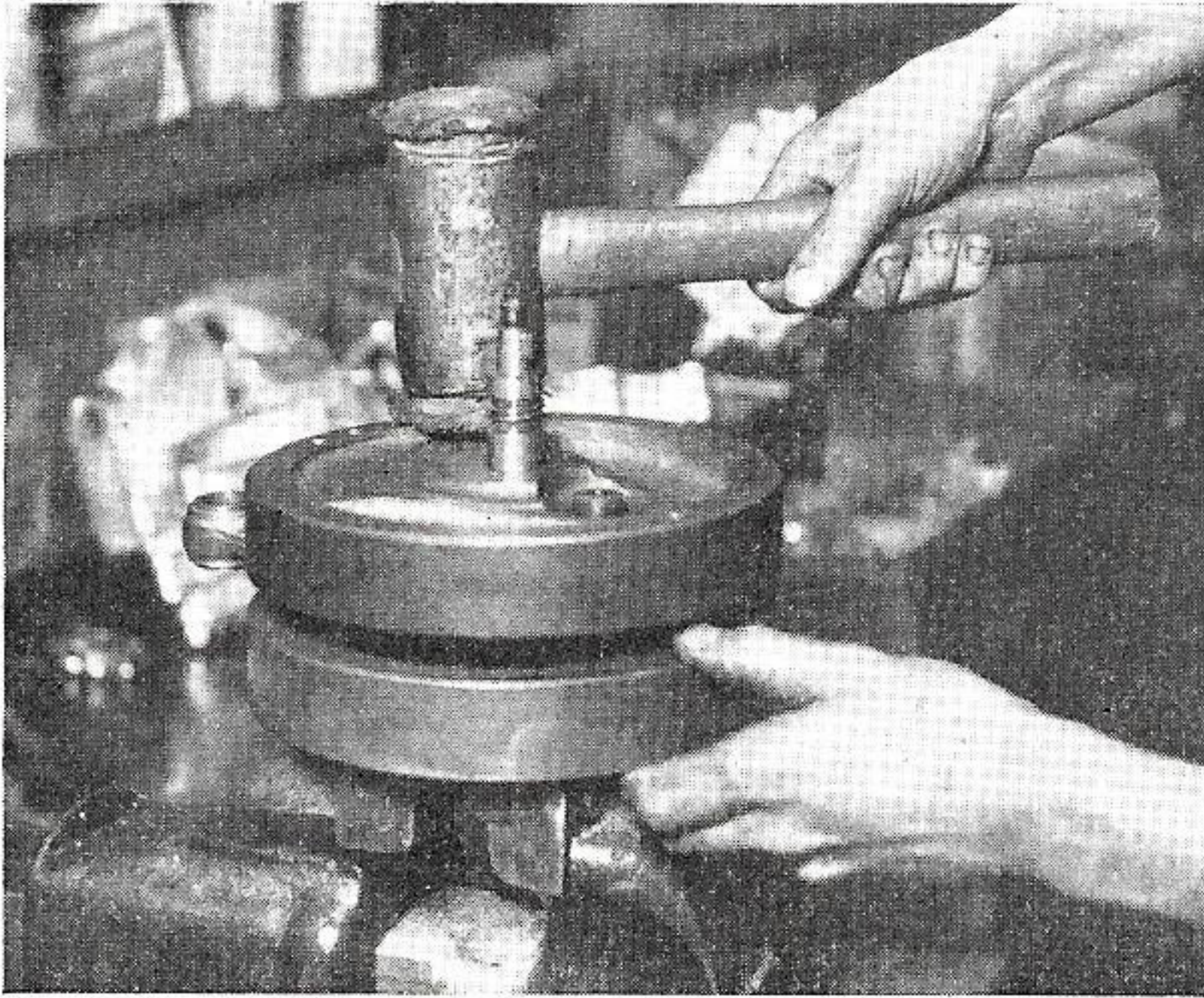


*Fig. 5.*—A SUBSTITUTE FOR A SPROCKET DRAWER.

Sprockets are best removed with a special withdrawal tool. If one of these is not available, an excellent substitute can be made from two hardwood wedges. First remove the sprocket retaining nut with its locking screw, and then drive the two wedges between the crankcase and the sprocket. Drive fairly hard home, and then "bump" the end of the flywheel axle with a mallet. This jar will release the sprocket.

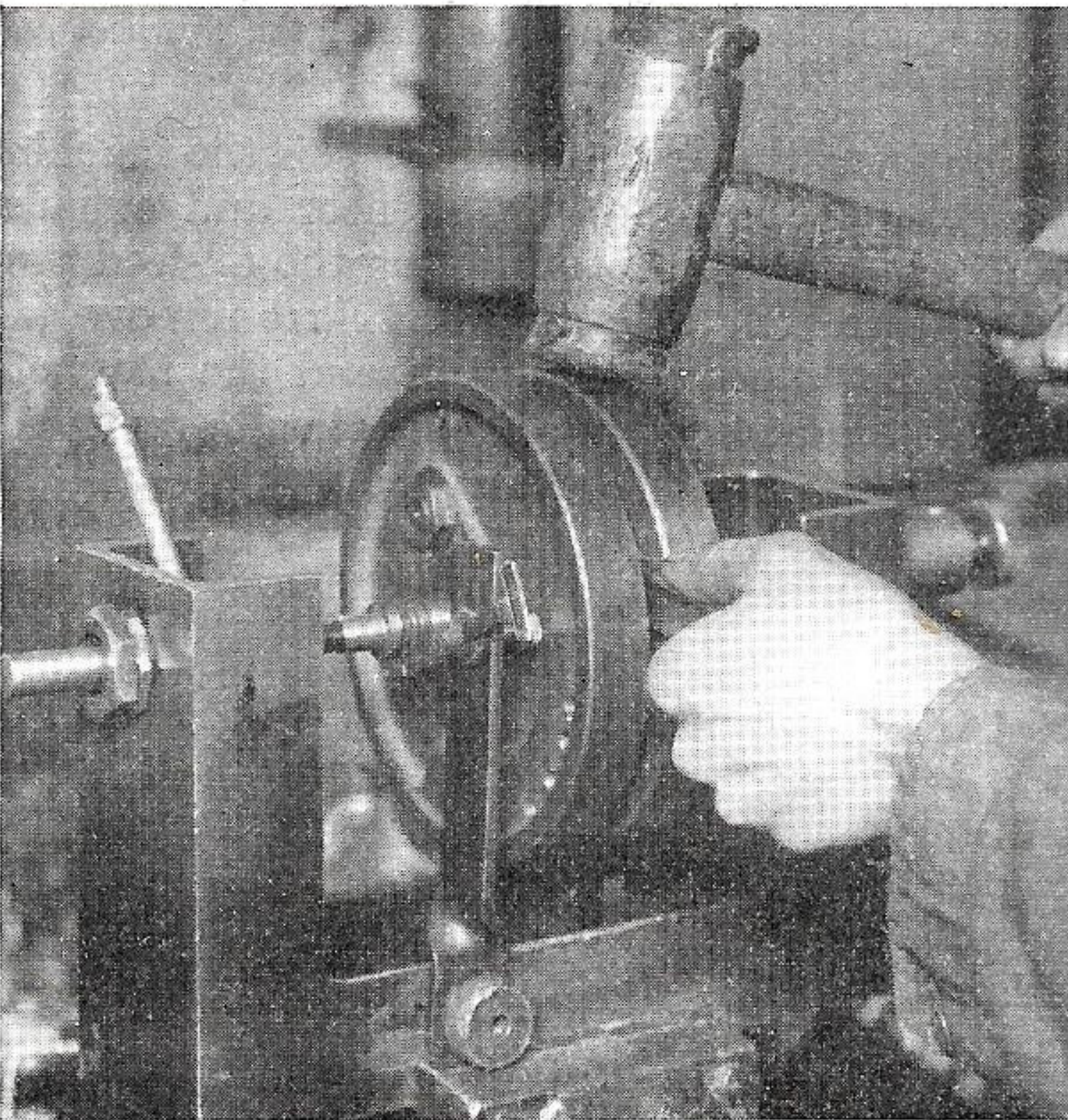


*Fig. 6.*—SHOWING THE POSITION OF THE KEYWAY IN THE CRANKSHAFT.



*Fig. 7.*—FLYWHEEL ASSEMBLY.

Make sure that the keyway in the axle is in the position shown in Fig. 6.



*Fig. 8.*—ADJUSTING THE FLYWHEEL ASSEMBLY.

Note the simple jig used for supporting the crankshaft and the indicator for testing the setting.

### Timing Gear

Lift out the timing-gear camshaft and the timing-gear cam levers and spacers. Unscrew the nut that retains the timing-gear small pinion. This has a LEFT-hand thread. The small pinion is a taper fit on the fly-wheel axle, so if a special withdrawal tool is not available it must be prised off. This is best done by using two tyre levers or similar tools. They should be placed so that the crankcase boss is used as a fulcrum and are opposite to each other; then by placing pressure on each lever at the same time the pinion should be released. In stubborn cases it might be necessary to partly replace the left-hand nut and give this several sharp blows with a lead-faced hammer while maintaining the pressure on the levers.

### Main Sprocket

The small screw locking the transmission retaining nut must be removed, followed by the nut. The sprocket can then be removed in a similar

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manner to that used to remove the timing-gear small pinion.

### Crankcase and Flywheel Assembly

Next take away the remaining crankcase bolts, which will enable the two halves of the crankcase to be separated, leaving the complete flywheel assembly. The operation of separating the flywheels should be performed on a clean piece of level paper in order to catch the big-end rollers, otherwise some of these may be lost. Take out the two locking screws that lock the two crankpin nuts. Remove these nuts, and then give the edge of one of the flywheels a good "bump" with a mallet or soft-faced hammer. This will release the flywheel, which should be lifted away, thereby allowing the connecting rod to be removed. Collect the rollers, and then tap out the crankpin from the second flywheel. Unless the flywheel axles are scored or otherwise damaged there is no need to remove them from the flywheels, but if it is desired to do so they may be removed in the same manner as the crankpin. Note that some 1930 and all 1931 crankpins are a parallel fit in the flywheels, and cannot be easily removed unless an "arbor" press is available.

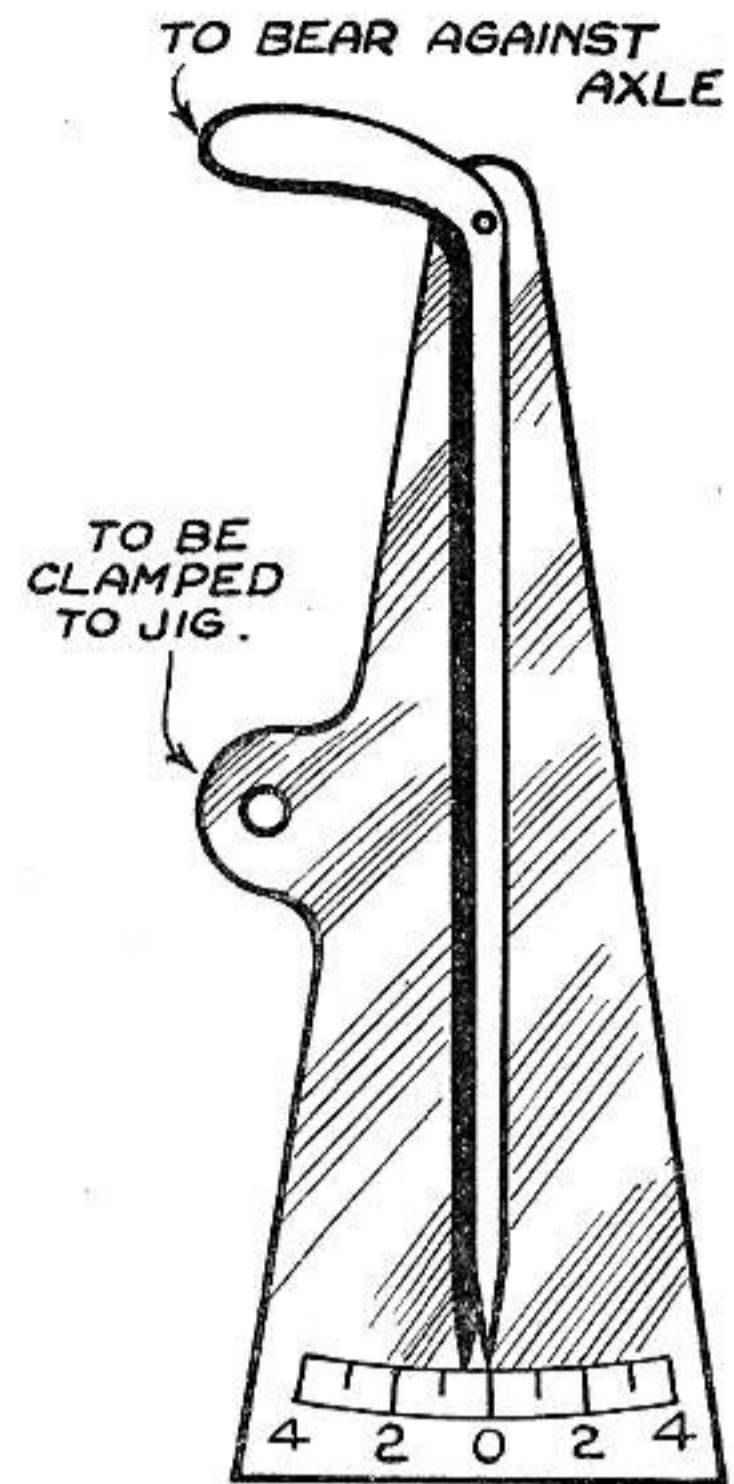


Fig. 9.—DETAIL OF INDICATOR FOR TESTING THE FLYWHEEL ASSEMBLY.

## HOW TO TEST PARTS FOR WEAR

### The Bearings

Having cleaned all the parts, the next thing to do is to examine and test them for wear. When doing this all the bearing surfaces should have a thin film of oil on them. The driving-side flywheel axle should fit into the roller cage and rollers, and the rollers, in turn, in the outer race, so that totally there is no appreciable up-and-down play. The timing-side flywheel axle should fit into its bush quite freely, and if any wear has occurred a new bush only will most likely provide the necessary correct fit.

### Crankpin and Connecting Rod

Examine the surface of the crankpin, and if in the least way it is pitted a new one should be used. Most connecting rods have the big end hardened and ground so that the rollers bear actually in the connecting rod. If the inner face of the rod is grooved or pitted this entails a new rod. Some models have a detachable hardened outer race that is pressed into the connecting rod. In those cases the renewal is a more simple matter.

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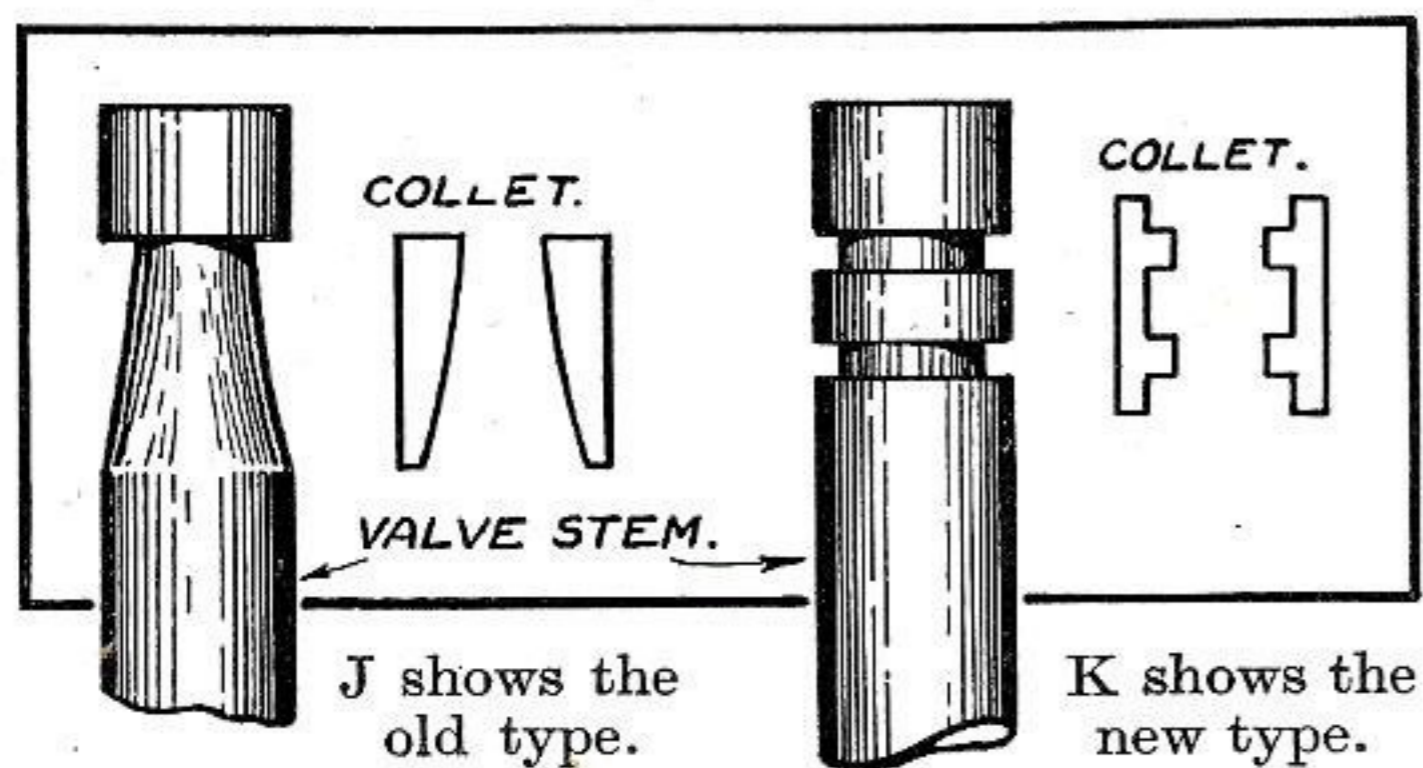


Fig. 10—OLD AND NEW TYPE OVERHEAD VALVE COLLETS.

indicate that play exists, because there is always a certain amount of movement noticeable. Rollers .001 inch larger than standard can be obtained for all Matchless engines, and in many cases the fitting of these enables the original connecting rod and crankpin to be used again.

### Piston and Gudgeon Pin

The gudgeon pin is intentionally a rather easy fit in both the piston and the bush. If replacements are considered necessary, first of all obtain a new gudgeon pin. Try this in the piston, and if the fit is not too easy and the piston is otherwise in good order, this may be used again. Before replacing a gudgeon-pin bush try the effect of removing the bush from the rod and then refitting it. This action sometimes closes the

Having decided if a new crankpin and/or a new connecting rod is required, assemble the big-end bearing by placing grease on the pin and "sticking" the rollers round it, afterwards placing the connecting rod over this assembly. The bearing should be free, but there should be no up-and-down play. Rocking the rod sideways on the pin does not

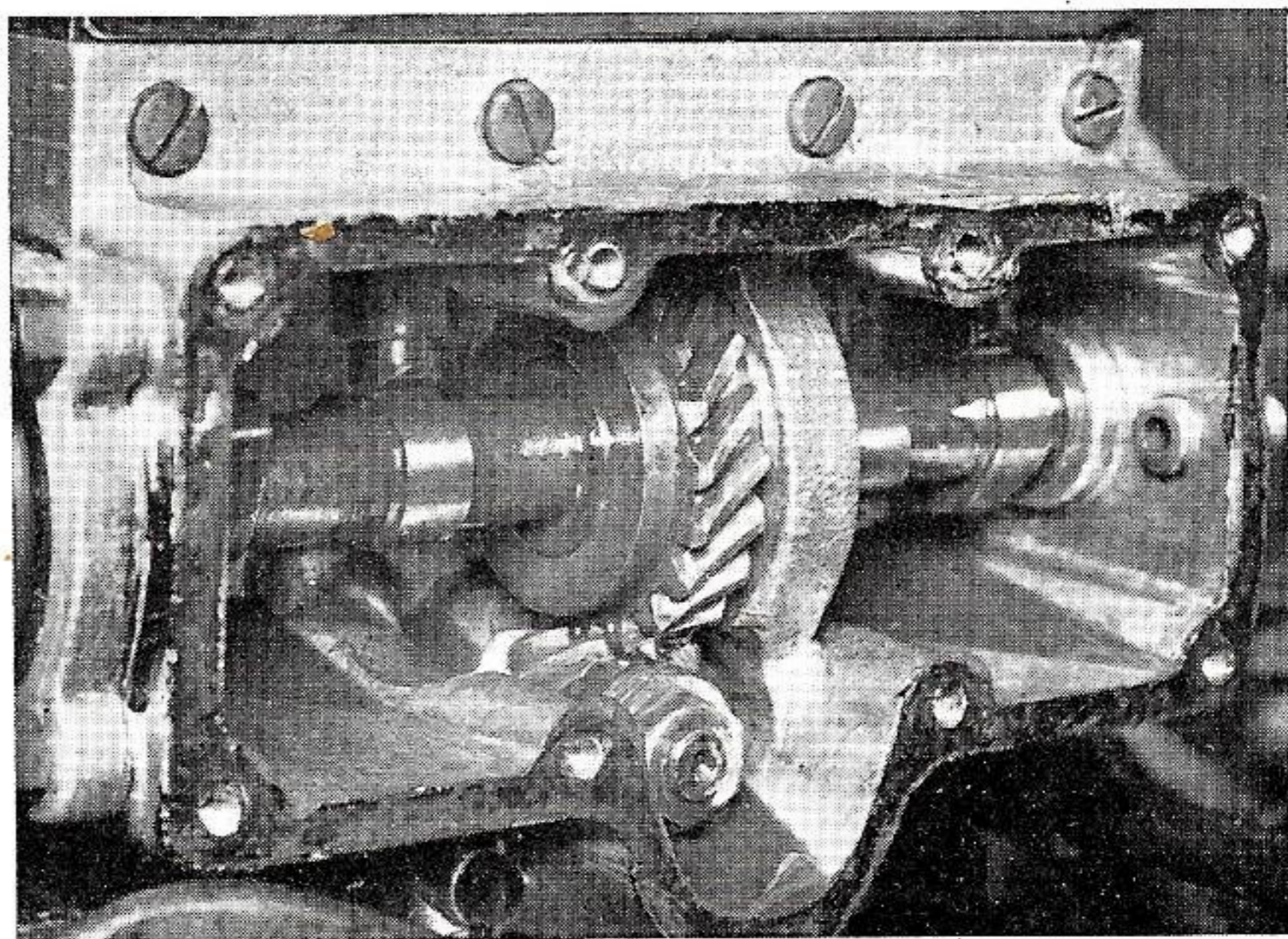


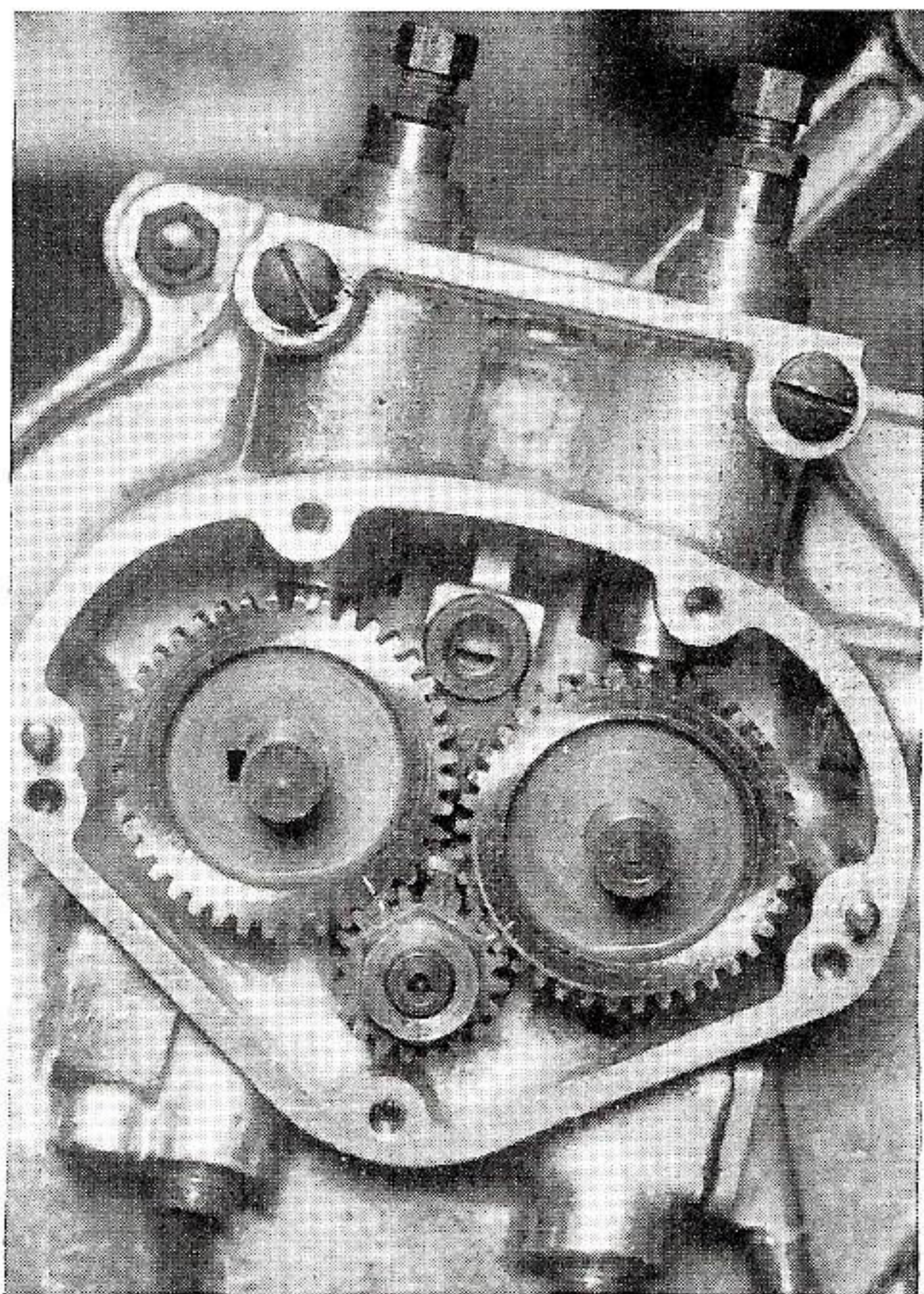
Fig. 11.—SETTING THE TIMING GEAR ON THE SILVER ARROW MODEL.

Note the timing marks on two teeth of the worm wheel. The worm thread has a mark on it to indicate the position of these teeth for correct timing. It will have been noticed from the Valve Timing Chart that all single-cylinder machines have the valve timing arranged so that the amount of lead is equivalent to the amount of lag. This renders valve timing a simple matter to set, because it is only necessary to place the piston at the extreme top of its stroke and then insert the timing-gear camshaft so that both of the valves are very slightly lifted for the timing to be correct.

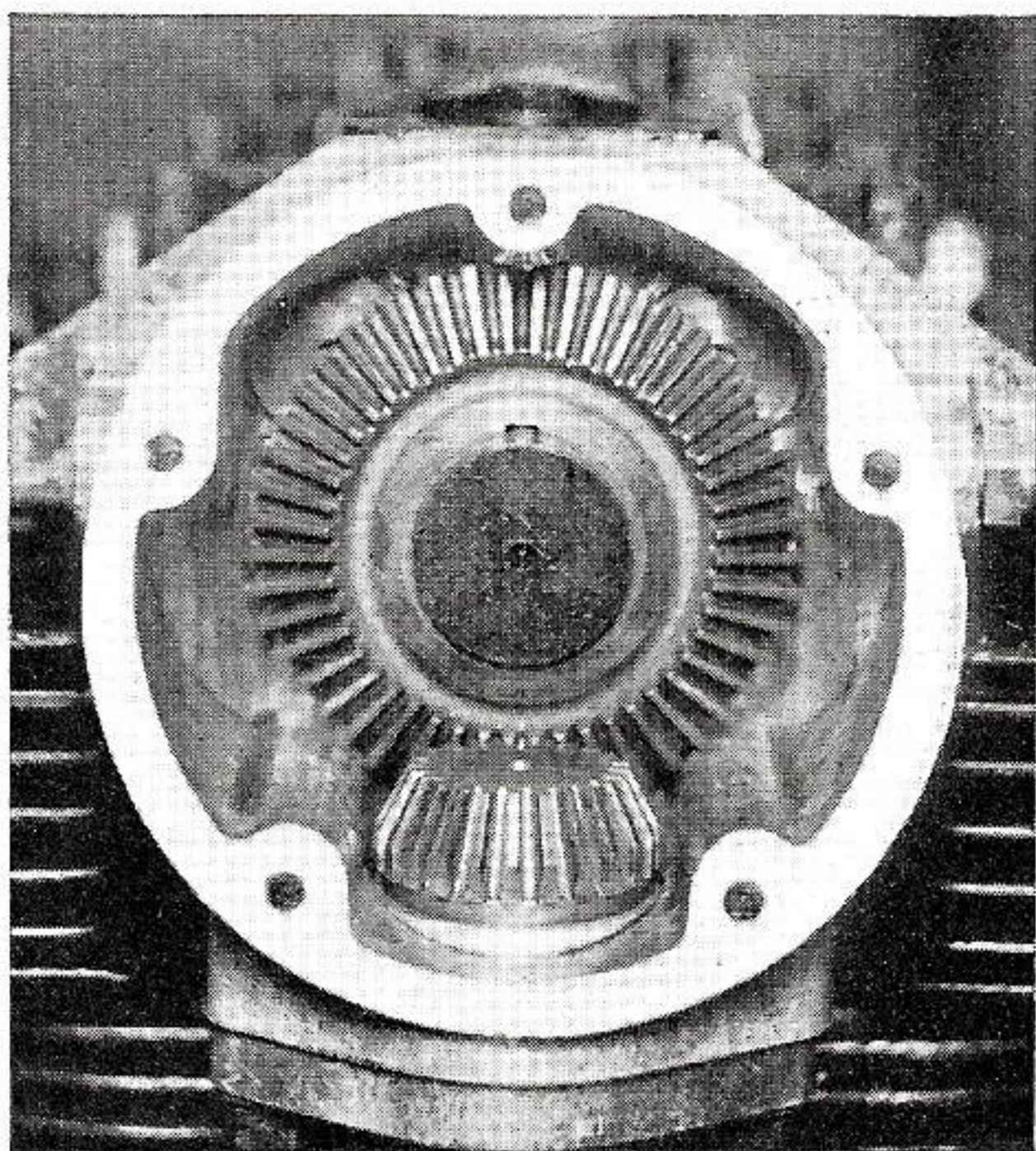
bush so that it is fit for more service. Guard against too tight a fit of the gudgeon pin in the bush, also make sure that the oil hole in the bush registers with the hole in the top of the rod. If the piston is of the split-skirt type, carefully examine the junction of the diagonal split with the horizontal split, and if there is the slightest sign of cracking the piston should be replaced. Remember that these pistons are taper and oval in shape. It will be advisable to fit new piston rings. These should have perfectly sharp edges, must be a free fit in the piston grooves, and the gap between each ring should vary from .004 inch on the small engines to .007 inch on the larger models.

### Timing Gear

Examine the timing-gear camshaft, and if the cam faces are damaged rubbing with an oil-stone slip may make this part fit for another period of service. It is essential that all grooves are removed, otherwise a replacement is merited. The timing-gear cam levers should receive similar attention. These parts are quite cheap, and if serious signs of wear are noticed new parts should be used. Considerable wear on the valve-actuating parts will prevent the correct opening of the valves as regards time and distance, and would thereby reduce the power output to a serious extent. The bushes for the timing-gear camshaft give



*Fig. 12.*—SETTING THE TIMING WHEELS.  
Note the timing marks.



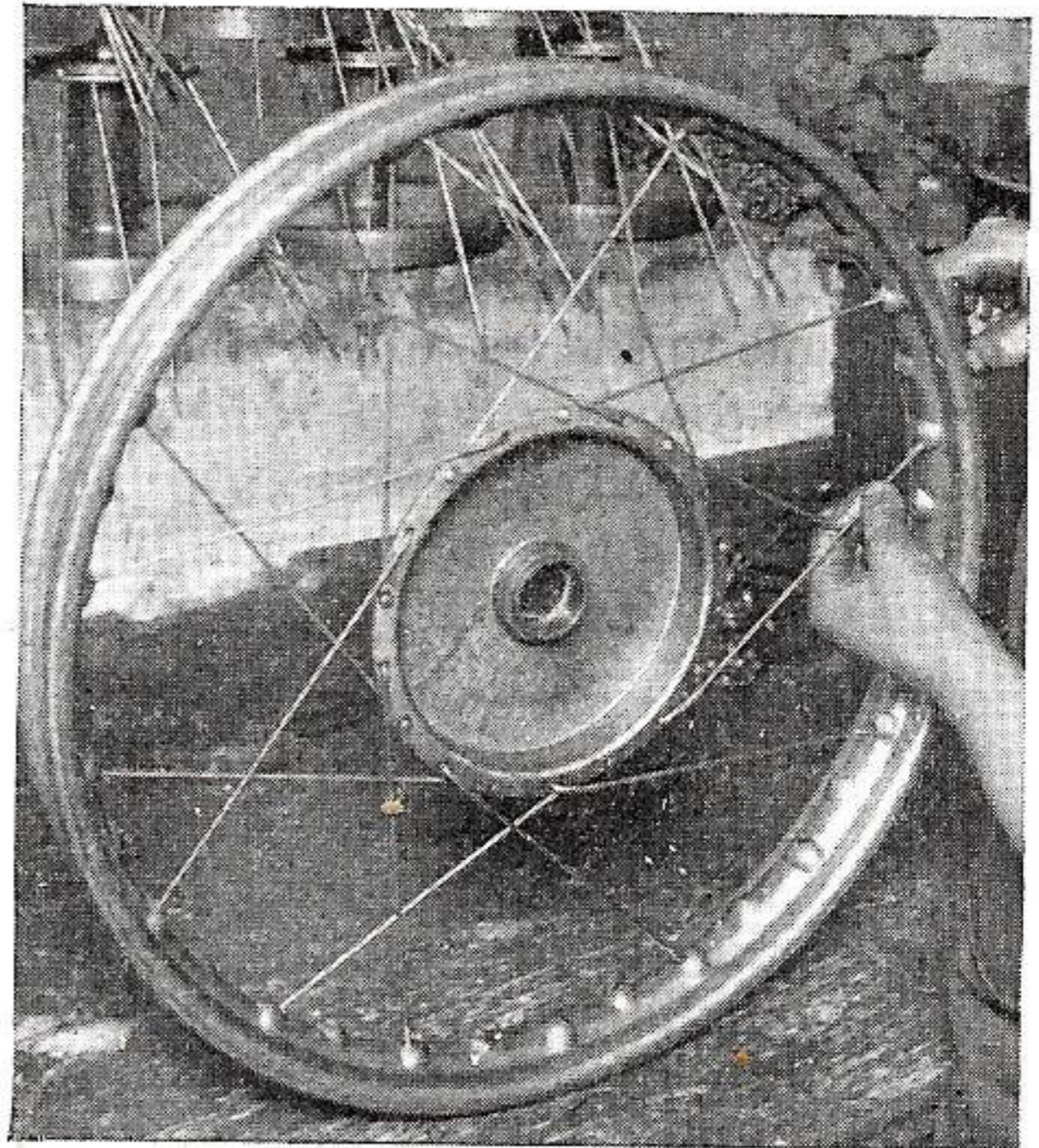
*Fig. 13.*—TIMING THE O.H.C. GEAR.  
Note the timing marks.

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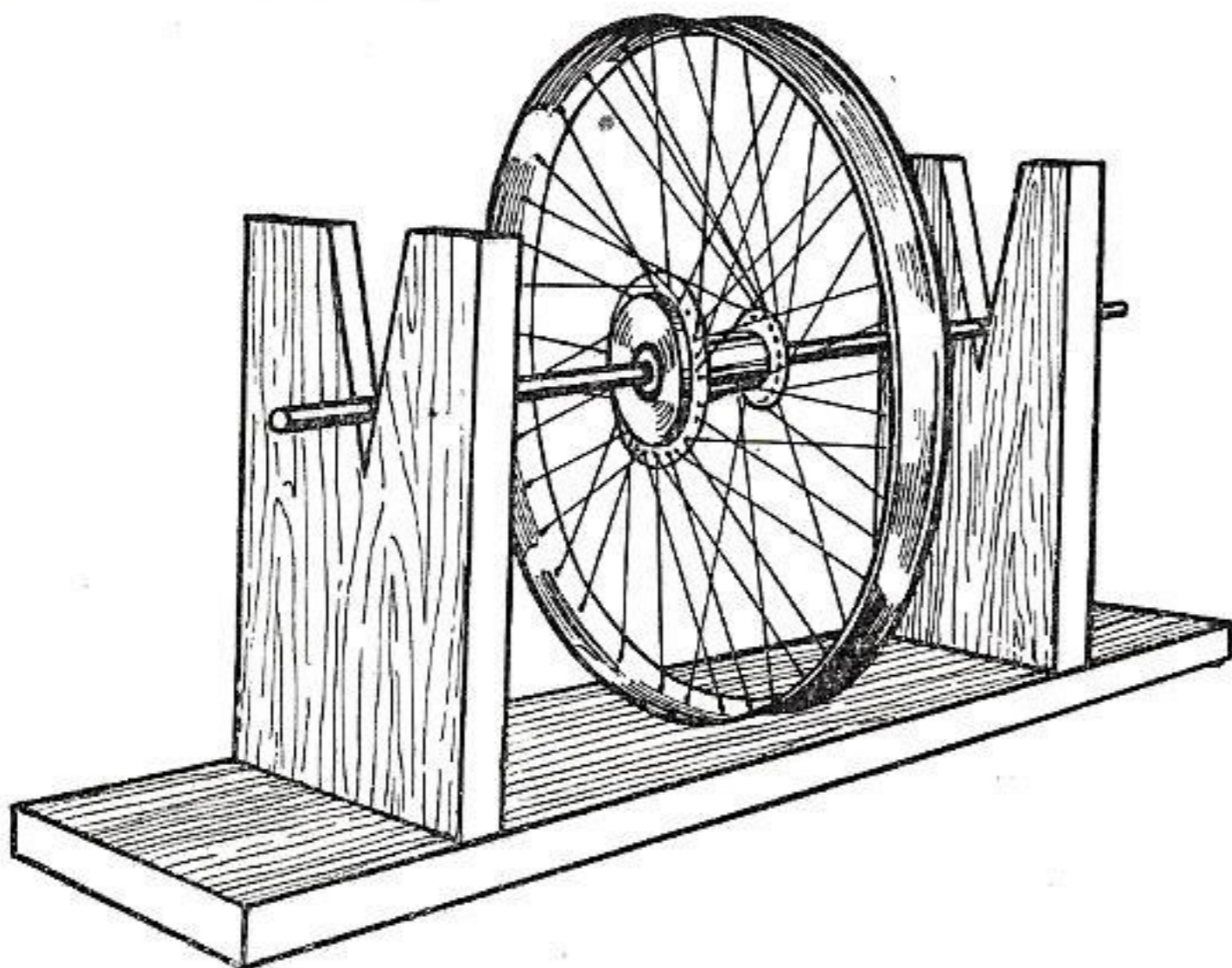
*Fig. 14.*—REMOVING THE REAR WHEEL.

Having removed the rear brake rod and rear chain it is usually a very difficult matter to withdraw the rear wheel from the machine, because the rear mudguard and rear forks all seem to be in the way. The dodge regarding easy removal is to take out the two bolts and nuts that retain the rear strap of metal riveted to the mudguard and bolted to the number plate. Upon these bolts being removed the mudguard can be strained over to the extreme right while the wheel is withdrawn to the left.



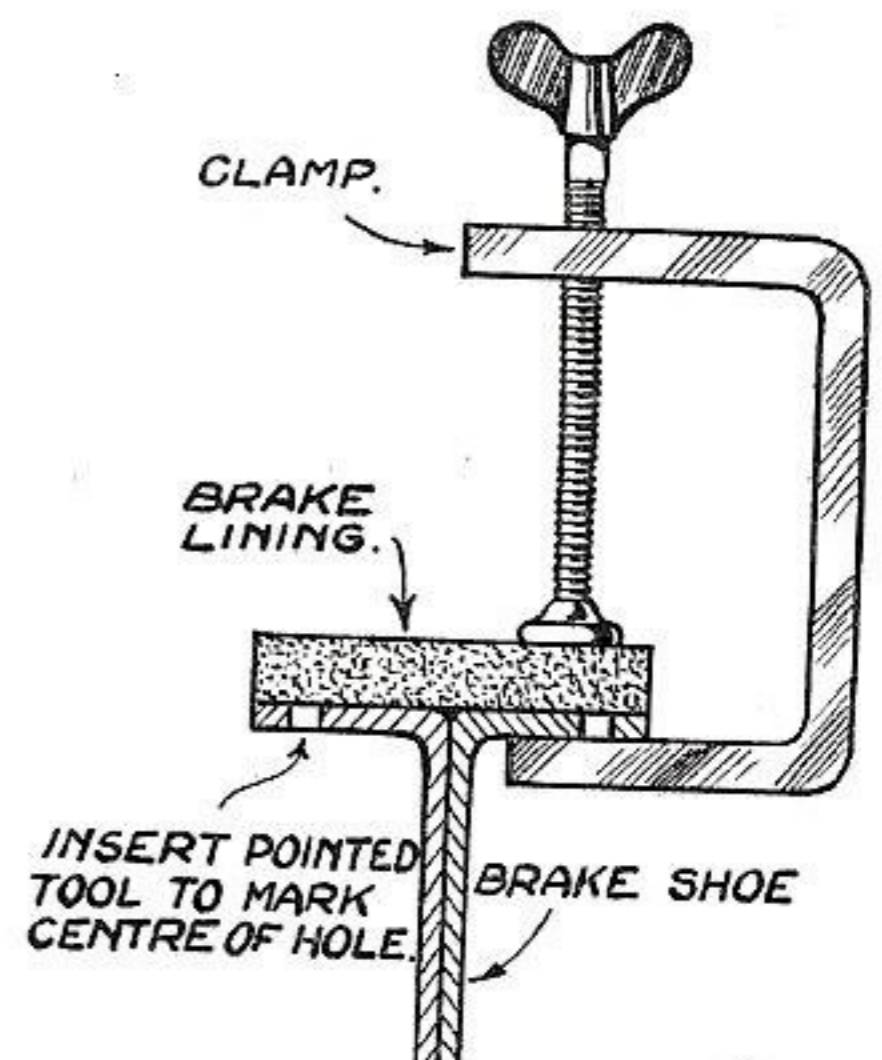
*Fig. 15.*—REPLACING DAMAGED SPOKES.

If it is necessary to replace a spoke it is advisable to carefully inspect the method of "lacing" before the old spoke is removed. Unscrew the spoke nipple till it is free, and then withdraw the broken spoke. Insert the new spoke in the hub flange. It may be necessary to bend the spoke, but this is of no consequence. Tighten the nipple till the spoke gives approximately the same note as the others when it is "twanged."



*Fig. 16.*—TRUING THE REBUILT WHEEL.

Place the wheel in a stand so that it may be rotated, and adjust the nipples till the rim runs quite true.

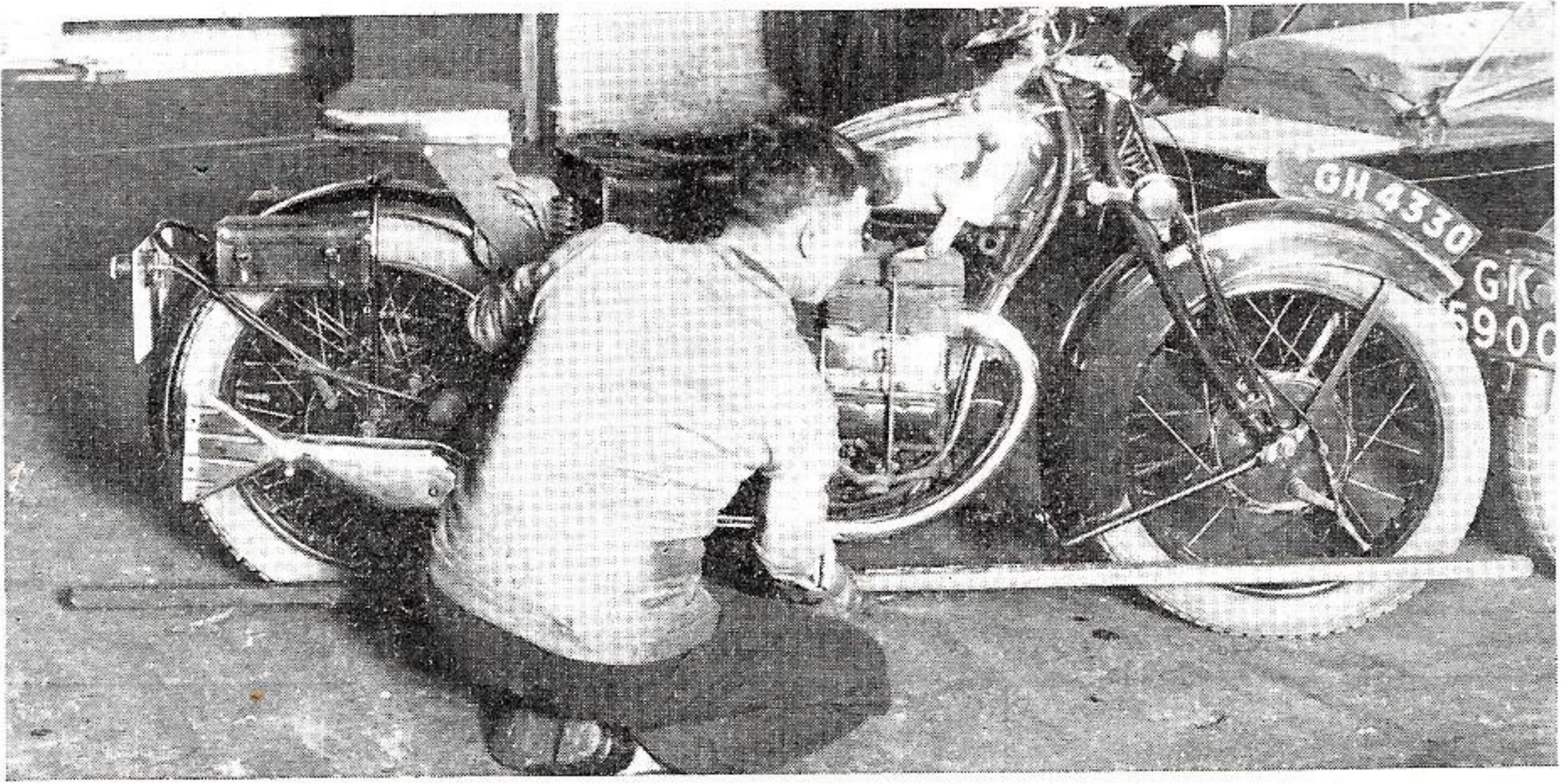


*Fig. 17.*—FIXING A BRAKE LINING.

Use a fretworker's clamp to hold the new liner on the shoe while the rivet holes are being marked and drilled.

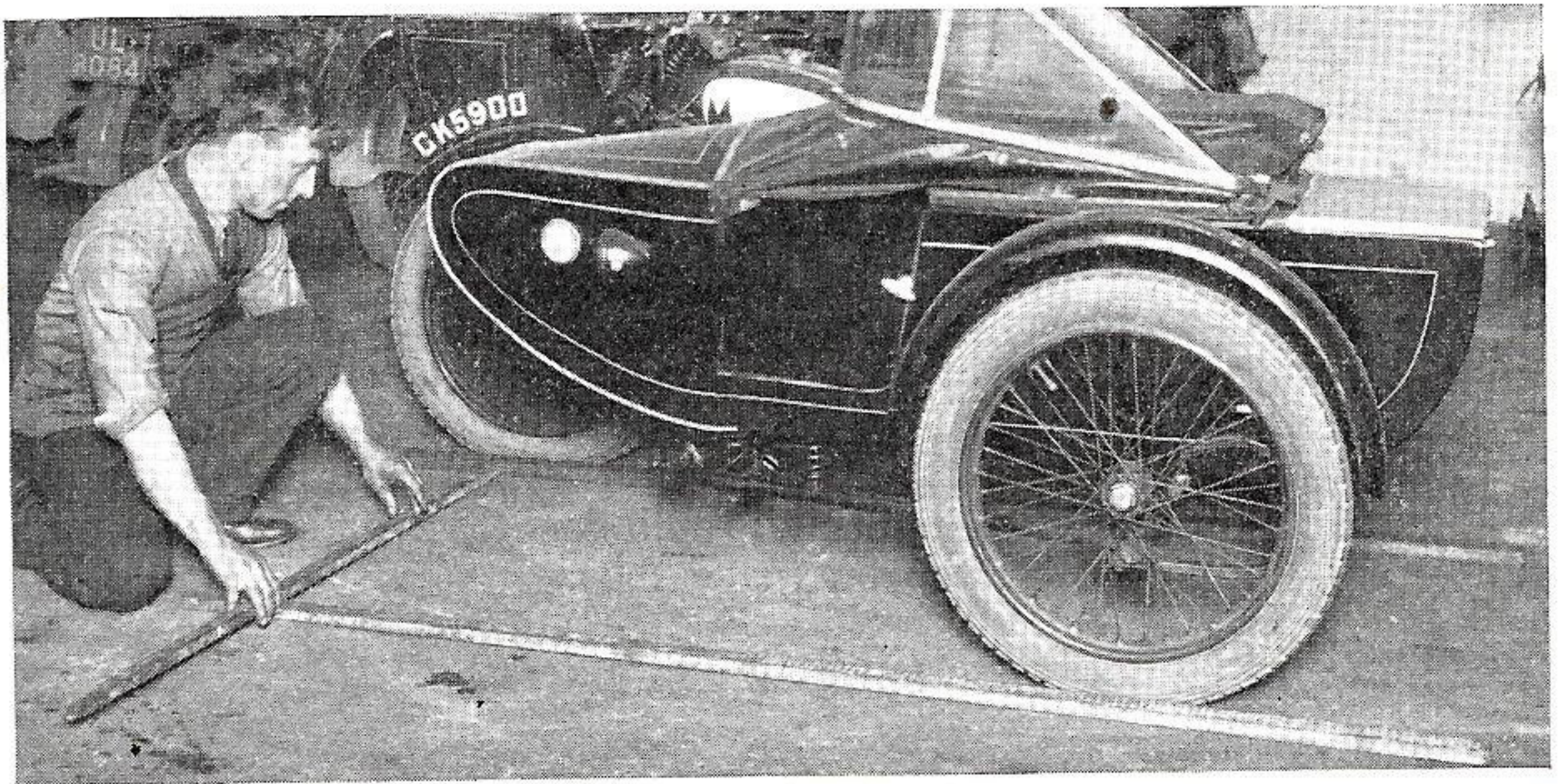


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*Fig. 18.*—WHEEL ALIGNMENT.

The alignment can be easily tested and, if necessary, reset by taking a piece of straight wood long enough to extend from one wheel to the other. It will be necessary to cut a piece out of the centre of the wood in order to clear the brake pedal and footrest assembly. After adjustment the tension of the rear chain should then be tested and if necessary reset.



*Fig. 19.*—TESTING THE SIDECAR ALIGNMENT.

To verify or reset the alignment of a sidecar it is necessary to stand the outfit on a level piece of ground. The clips holding the side arms to the sidecar chassis should be released by partly unscrewing each clamping bolt. The motor-cycle should be held so that it is slightly leaning away from the sidecar. The correct angle is  $6^\circ$  from the perpendicular. Place two straight strips of wood so that one is lying on the ground touching both rear and front wheels and the other so that it is parallel to the sidecar wheel. Then pull the chassis from the machine (or push it to the machine) till the measurement between the two pieces of wood is about  $\frac{3}{8}$  inch less when measured at the front to that measured at the rear. When the operation of resetting is finished all the clamping bolts must be rendered very tight.

a very extended service, and replacements although cheap are rarely needed.

### The Cylinder

The cylinder must have all the carbon scraped away and the piston tested in it for fit. To the uninitiated the fit will doubtlessly appear to be very sloppy. This, to a certain extent, is absolutely necessary. The correct clearances are given in the chart below, additional clearances up to two or three thousandths of an inch are of no consequence, and at the worst can only result in piston slap when the engine is cold. This is of no consequence.

TABLE SHOWING CORRECT PISTON CLEARANCES

	BORE OF CYLINDER.				
	54 mm.	62.5 mm.	69 mm.	82.5 mm.	85.5 mm.
Top Land . . . . .	.019"	.022"	.023 "	.025"	.025"
Second Land . . . . .	.014"	.018"	.018"	.019"	.019"
Boss . . . . .	.008"	.005"	.005"	.0055"	.0055"
Skirt . . . . .	.005"	.003"	.003"	.0035"	.0035"

### Valves and Guides

Side-valve engines are fitted with valves marked "IN" and "EX," to indicate inlet and exhaust valves. Inlet valves are made of 3 per cent. nickel steel and exhaust valves of stainless steel. Valve dimensions are identical, and an exhaust valve may be used as an inlet valve without harmful results, but on no account, except as a means of "getting home," must an inlet valve be used as an exhaust valve.

All valve guides are made of chilled cast iron, and are parallel inside and out. They are a press-in fit in the cylinders (or cylinder heads). See Valve and Valve Guide Repairs (page 184).

## REASSEMBLY

### Flywheel Assembly

The driving-side flywheel axle is keyed so that it can only be replaced in one position. The retaining nut must be very fully tightened and finally locked with the small screw. Beware of excessive tightening, otherwise the flywheel will crack. The timing-side flywheel axle must be replaced in one position if due consideration is going to be given to the punch marks on the timing wheels. When a straight line is drawn through the axes of the crankpin and the flywheel axle the keyway in the axle should be in a central position on that line. Fig. 6 illustrates this point. This axle must be fixed exactly as the driving-side axle. Next fit the crankpin in

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the driving-side flywheel and fix it with the nut and locking screw. If the pin is drilled with oilway holes these must register with the holes in the flywheels. Assemble the connecting rod and rollers as already described for testing purposes, mount the timing-side flywheel on the crank-pin and reasonably tighten the nut.

### Crankcase, Timing Gear and Oil Pump

After truing up the flywheels (Fig. 7 and fig. 8), refit into the crankcase, making the transmission-side rollers and cage go right "home." Smear axle shafts, bearings, etc., with a little oil. Assemble the timing gear, making sure the left-hand nut securing the small pinion is fully tight, but do not overdo or the pinion may burst or crack (see Figs. 11, 12 and 13). On those models fitted with a mechanical pump on the timing cover, the small block threaded on the oil-pump shaft must engage with the jaws on the camshaft.

### Piston

Refit the piston, and note the split in the skirt must face forwards. Clean out the gudgeon-pin retaining-ring grooves, and fit new retaining rings if these are at all doubtful.

Before leaving the consideration of a complete engine overhaul it should be noted that economy as to the fitting of new piston rings, valve springs and cylinder-base paper washers is ill advised.

### Notes on O.H.V. Engine

The method of dealing with overhead-valve engines is exactly the same as detailed for side-valve models. The overhead-valve gear of course requires special treatment. Nearly every o.h.v. model has double valve springs. These prevent the tendency to valve bounce that might occur at high engine speeds. Most o.h.v. rockers are mounted on roller bearings, and grease should be used to locate the rollers when assembling these. Two types of overhead valves have been used. The earlier type is shown in Fig. 10, J. It will be noted that the split valve collets are plain, while the later type is shown in Fig. 10, K, in which the collets are of a special type. When type J valves are replaced with type K valves, it should be noted that in addition to the special collets it is also necessary to use a different type of valve spring top collar.