



# WORKSHOP MANUAL

AND

# SERVICE BULLETINS

*Berini* M 21

AUTOCYCLE

CYCLEMASTER LTD., TUDOR WORKS,  
CHERTSEY ROAD, BYFLEET, SURREY



# WORKSHOP MANUAL

FOR THE

***Berini*** M 21

49c.c. AUTOCYCLE

**CYCLEMASTER LTD., TUDOR WORKS,  
CHERTSEY ROAD, BYFLEET, SURREY**



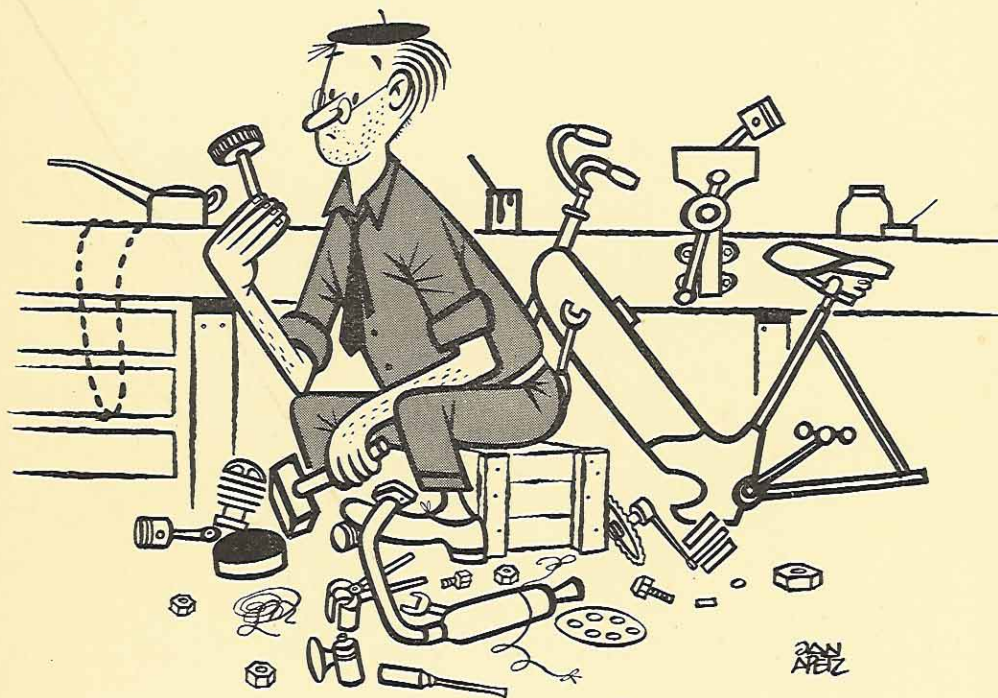
## IMPORTANT

This manual has been especially made to assist you when carrying out repairs and to do them as fast and efficiently as possible.

Therefore read this book carefully and follow the recommended methods. It will save you much time and annoyance.

Always heat the aluminium parts, before dismantling them. This will prevent damage.

Never do it like this:

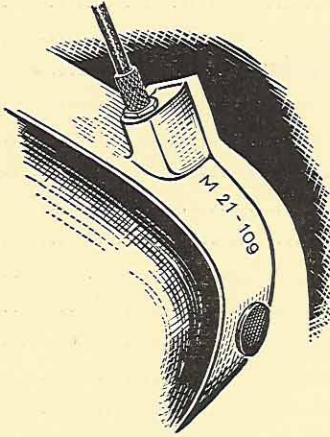
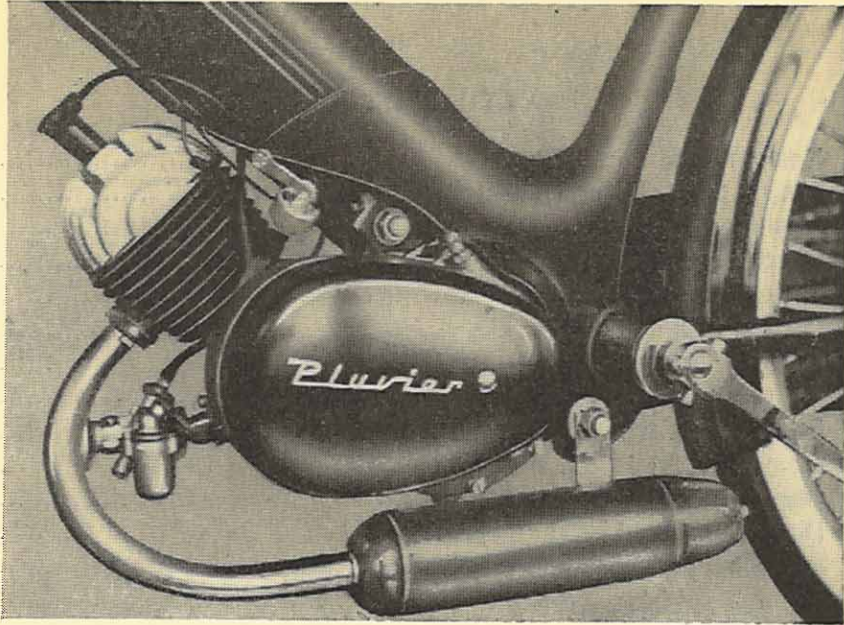


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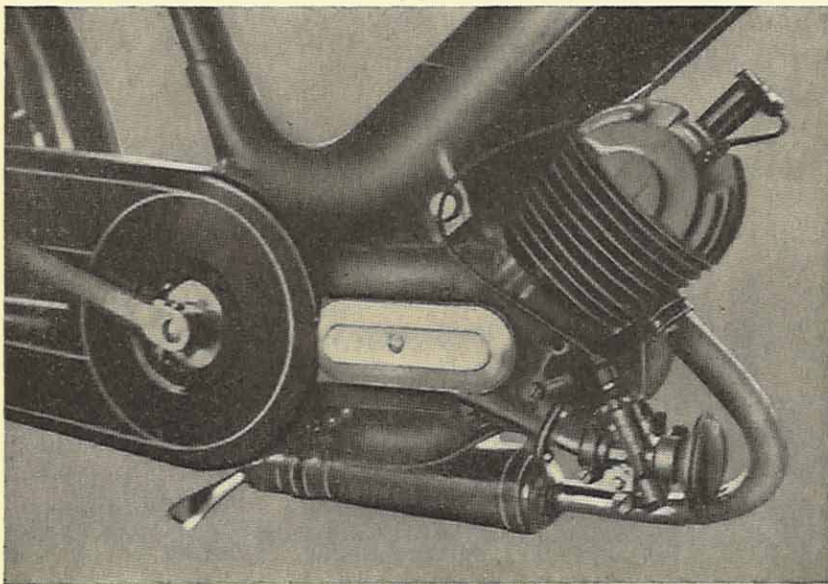


MAGNETO  
SIDE



Location of engine number:  
On clutch housing, immediately  
behind adjuster screw of clutch cable

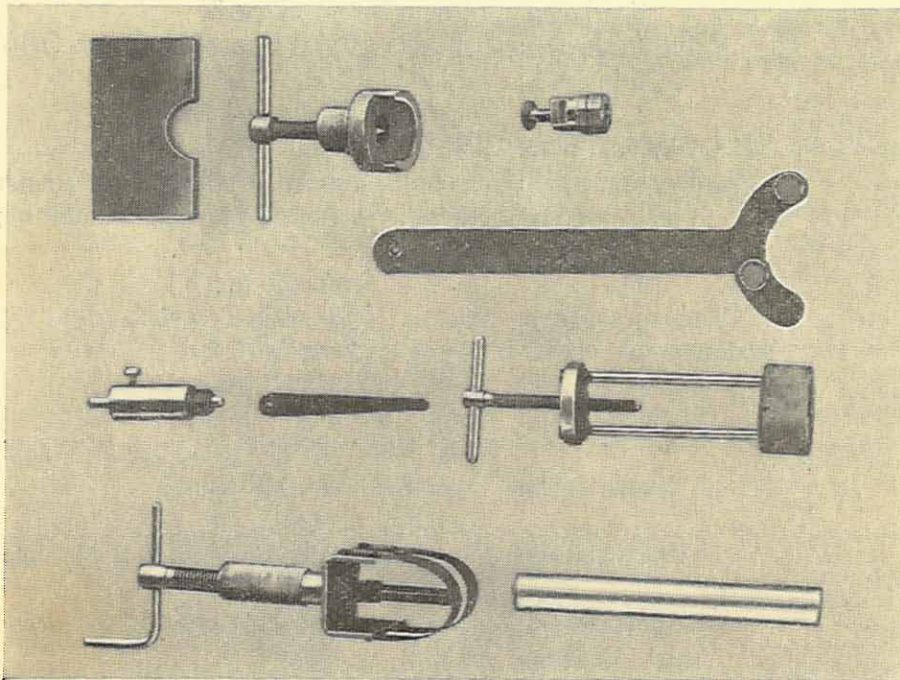
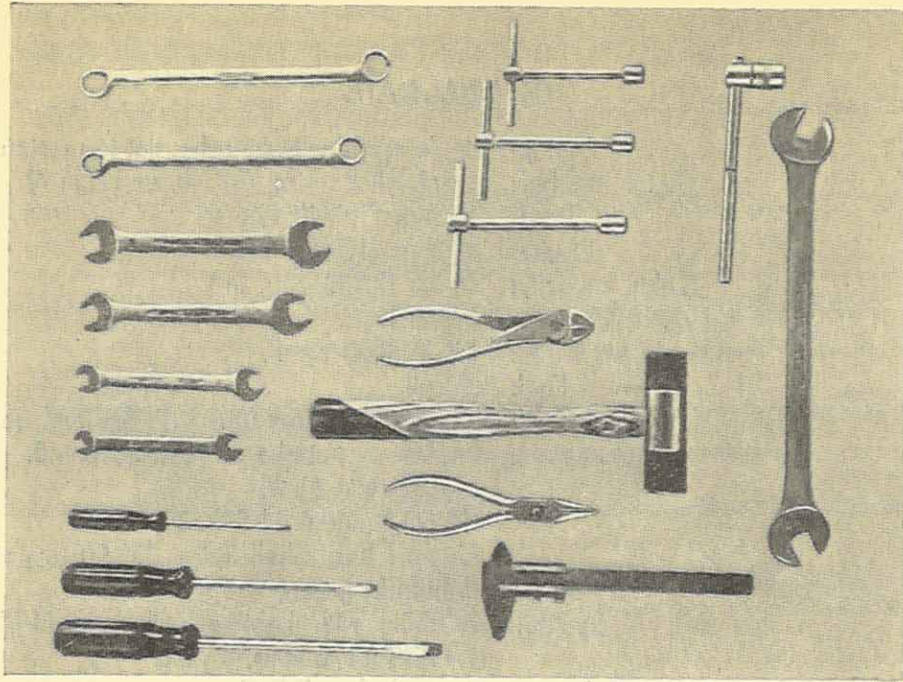
INLET SIDE



## GENERAL DATA

Engine: single cylinder two-stroke, flat top piston  
 Engine number: on clutch housing (see ill. on page 4)  
 Bore: 40 mm (1.5748 in.)  
 Stroke: 38 mm (1.4960 in.)  
 Cubic capacity: 48 cc (2.928 cub. in.)  
 Compression ratio: 6.5 to 1  
 Developed b.h.p.: 1.7 at 4800 r.p.m.  
 Fuel: Petroil  
 Tank capacity: approx. 2.5 Litres (just over ~~1~~<sup>1</sup>/<sub>4</sub> Imp. gall.)  
 Lubrication: **Engine:** two-stroke oil SAE 30 or 40.  
 Mixing ratio 1 : 25  
**Clutch:** engine oil SAE 30 or 40  
**Coaster hub:** Shell Spirax EP 90 (hypoid)  
**Frontfork:** grease  
 Ignition: BOSCH with lighting coil, type LM/UP  
 1/115/8 R1, 6 volts, 8 watts  
 Advance: 2 mm before T.D.C.  
 Contactbreaker gap: 0.45 mm (.018")  
 Sparkplug: 14 mm, KLG F 50 or 70  
 Electrode gap: 0.40 mm (.016") to max. 0.45 mm (.018")  
 Carburettor: ENCARWI with automatic choke  
 Jet: running-in 58, normal 56  
 Weight float: 2.2—2.4 gramm  
 Fuel consumption: at constant speed of 40 km/h (26 m.p.h.)  
 approx. 1 L per 60 km (approx. 190 m.p.  
 gall.)  
 Max. speed: up to 50 km/h (38 m.p.h.)  
 Climbing capacity: approx. 12 % (without pedalling)  
 Weight compl. engine: approx. 11.5 kg (25.5 lbs)  
 Weight compl. autocytle: approx. 43 kg (92 lbs)  
 Length clutch cable: outer 105 cm (41<sup>11</sup>/<sub>32</sub> in.)  
 inner 115.5 cm (45<sup>15</sup>/<sub>32</sub> in.) between nipples  
 Length throttle cable: outer 108.5 cm (42<sup>23</sup>/<sub>32</sub> in.)  
 inner 123 cm (48<sup>13</sup>/<sub>32</sub> in.) behind nipple  
 Primary drive: Gears in oilbath. Crankshaft: steel; clutch:  
 plastic  
 Drive chain: 1/2" x 3/16", 112 links  
 Total reduction: 1 : 14.7  
 Bicycle chain: 1/2" x 1/8", 90 links  
 Clutch: Multiple plate, wet. Corklined  
 Free travel at lever: approx. 1 mm (3/64")  
 Sprockets: engine { drive sprocket 14 teeth  
 rear sprocket 46 teeth  
 cycle { rearwheel 18 teeth  
 crankblade 35 teeth  
 Tyresize: 25" x 2"  
~~Wheelsize: 24" x 1 1/2" x 2"~~  
 Spokes: 18 nr. 12, length 256 mm  
 18 nr. 12, length 250 mm  
 36 nr. 12, length 246 mm





**NECESSARY TOOLS AND EQUIPMENT**

Order number

- |  |           |
|--|-----------|
| 1. Extractor for removing and fitting gudgeon-pin.     | 13 656—23 |
| 2. Feeler gauge for contact breaker and sparkplug gap. | 13 659—04 |
| 3. Timing adjuster to set firing point.                | 13 660—04 |
| 4. Extractor for ballrace on long end of crankshaft.   | 19 652—03 |
| 5. Dolly for replacing ballraces.                      | 13 661—04 |

The above special tools are part of the complete set of BERINI M 13 or M 19 tools.

**Supplementary set**

- |  |           |
|--|-----------|
| 1. Magneto-rotor steady.                                   | 21 651—03 |
| 2. Extractor for ballrace on short end of crankshaft.      | 21 657—03 |
| 3. Support plate for crankshaft, when replacing ballraces. | 21 660—04 |
| 4. Extractor for BOSCH flywheel.                           | 21 667—04 |

These tools can be ordered from our stores in a cadmium-plated finish. Prices and delivery terms on application.

**Other necessary tools**

- |                            |   |
|----------------------------|---|
| 1 Heavy screwdriver        | 1 Boxspanner 10 mm                              |
| 1 Medium-sized screwdriver | 1 Boxspanner 11 mm                              |
| 1 Small screwdriver        | 1 Boxspanner 14 mm (thinwalled for flywheelnut) |
| 1 Spanner 8—9 mm           | 1 Pedalspanner 15.25 mm                         |
| 1 Spanner 10—11 mm         | 1 Long-nosed pair of pliers                     |
| 1 Spanner 14—15 mm         | 1 Side-cutting pair of pliers                   |
| 1 Spanner 16—17 mm         | 1 Hammer (fibre) 500 gr. (18 ozs)               |
| 1 Ringspanner 14—15 mm     | 1 Columbus gauge                                |
| 1 Ringspanner 16—17 mm     |   |
| 1 Boxspanner 9 mm          |   |

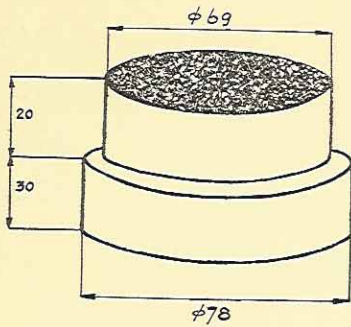
**Temperature for dismantling**

Correct heating of aluminium parts is essential, in order to take them apart without causing damage. The easiest way to determine the right temperature is to apply a drop of moisture (some spittle) on the aluminium while heating them. If this contact causes a sizzling noise, the correct temperature of approx. 80° C. is attained.

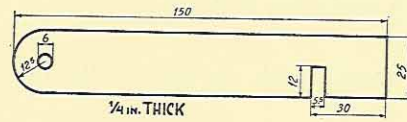


## SELF-MADE TOOLS AND EQUIPMENT

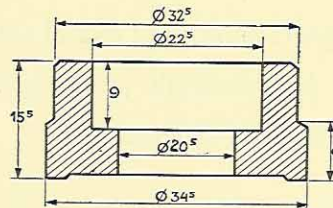
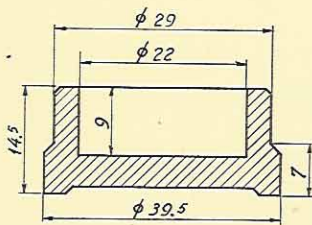
All dimensions are in millimeters



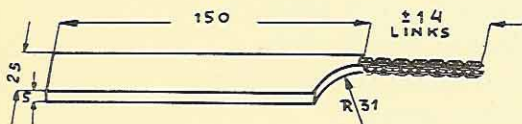
ill. 1



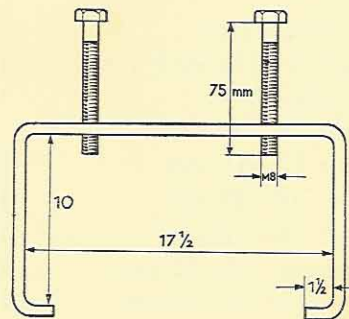
ill. 2



ill. 3



ill. 4



ill. 5

- ill. 1. Abrasive disc for re-grinding sealing edge for rotary induction valve in the right-hand section of the crankcase. Use Jewelite Waterproof 150 C 73 1960 and glue this firmly to the disc.
- ill. 2. Connecting rod steady.
- ill. 3. Pads for fitting gas seals and ballraces.
- ill. 4. Sprocket spanner.
- ill. 5. Clamp for compressing clutchplates. Material: flat iron  $\frac{3}{4}'' \times \frac{5}{16}''$ , stretched length 41 cm ( $16\frac{15}{16}$  in.).

## 1. CHECKING THE ENGINE

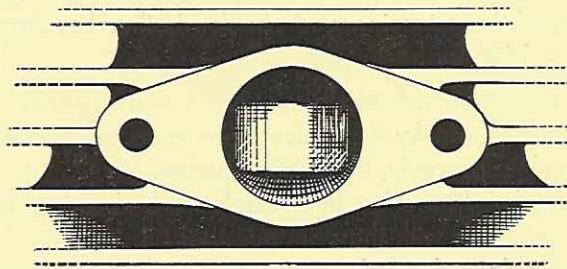
(Engine is not dismantled)

This should be carried out in case of complaints about reduced power of the engine, which may have various reasons. (It is assumed that the carburettor is checked and the sparkplug shows a bright, blue spark).

1. Carbon deposit in **exhaustport**, on pistontop **at transferports, in transferports themselves, in exhaustsystem and silencer.**
2. Airleak in crankcase. Cause may be:  
Gas and oilseal; cylinderbase gasket; inletgasket; worn or sticking piston-rings; too much clearance between cylinder and piston.

Start checking as follows:

- a. Remove sparkplug, carburettor, exhaust and fillerplug (upper).
- b. Rotate engine by hand with flywheel in direction of rotation, until bottom pistonring is just beyond top of exhaustport. Seen via port (remove exhaust!) the picture is as shown in ill. 6.



ill. 6

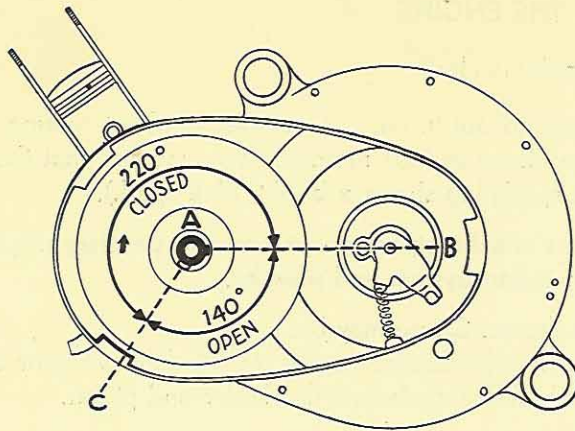
- c. Now blow with smoke (from cigarette or pipe) into inletpipe, forcing the smoke to appear via the airleak. This is then the reason why the engine pulls less. In case of a leaking gas and oilseal, smoke will appear from the fillerhole.  
If pistonrings are worn or stuck in their grooves, smoke will be forced out via sparkplughole, if more pressure is applied. In this case, keep exhaustport covered with finger.  
If piston is worn or grooved seriously, smoke will come from exhaustport even at light pressure.

3. **Checking sealing of disc valve (if it doesnot leak in closed position).** Disc valve opens  $90^\circ$  before T.D.C. and closes  $50^\circ$  after ~~S~~D.C. It should therefore be open  $140^\circ$  and closed  $220^\circ$  (see ill. 7). <sup>T</sup>

Proceed as follows:

- a. Remove carburettor from inletpipe.





ill. 7

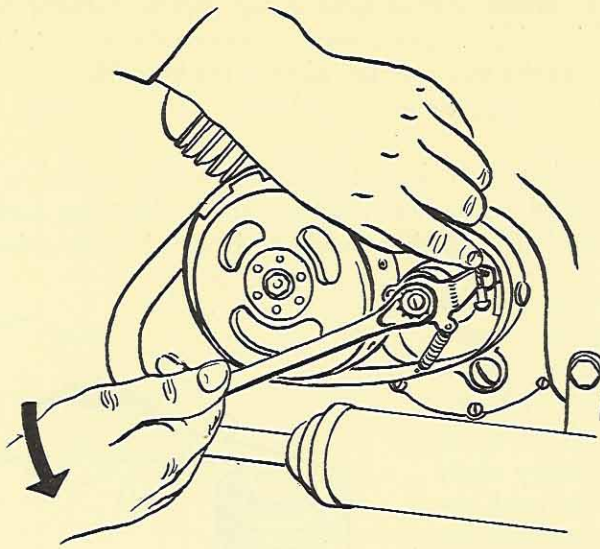
- b. Remove cylinder, flywheel <sup>NUT</sup> and springwasher.
- c. Blow lightly into induction pipe and turn engine very slowly by hand **in direction of rotation** (clockwise), until disc valve begins to open (see ill. 7, line A-B).
- d. **Continue to blow** and keep on turning engine very slowly till it is felt that valve is closed. Stop turning and check whether keyway points towards line A-C (= 140° further).
- e. **Now suck** the remaining circle (= 220°) and continue to turn engine slowly. In case of a leaky disc valve there is no resistance while sucking. If valve is sealing properly, there is resistance.  
Remove a leaky disc valve and touch-up its bearing surface in R.H. section of crankcase with the selfmade tool (ill. 1).  
If necessary replace disc valve (see operation 13 on page 20).

## 2. REMOVING THE ENGINE

For this it is necessary to dismantle chainguard (and R.H. pedal).  
Cylinderhead and cylinder can be left untouched.

Remove successively:

1. Flywheelcover.
2. Clutchcable from lever (see ill. 8). It is necessary **first of all** to tighten nut firmly! (see page 30; ill. 49).
3. Clutchcable adjuster from clutchhousing.
4. Exhaust.
5. Lighting connection.
6. Chainguard (if needed R.H. pedal).
7. Connectorlink from drivingchain.
8. Carburettor.
9. Lower suspension bolt.
10. Upper suspension bolt.



ill. 8

### 3. FITTING THE ENGINE

This could be carried out in reversed order from removing the engine. Pay particular attention to:

1. Adjustment of clutch (see page 29, operation 34).
2. Adjustment of driving chain (see page 13, operation 5).

### 4. DECARBONIZING THE ENGINE

The engine is designed in such a way, that it can be left in the frame while decarbonizing it. It is however necessary to clean the engine externally with pure petrol, especially where the cylinder joins the crankcase.

1. Remove exhaust. The connection on the lower engine bolt can be left in its place, but should be loosened a little. After undoing and removing both screws holding the flange to the cylinder, the exhaust can be lowered and put out of the way.
2. Undo the four cylinderhead nuts and remove them, together with their spring washers and plain washers.
3. Take off cylinderhead.

**NOTE.** There is no cylinderhead gasket.

4. Lift cylinder **straight** up carefully. If cylinder studs are taken out, **do not twist** cylinder otherwise there may be breakage of the pistonrings.
5. As soon as the cylinder is removed, pack crankcase with a **clean** rag around the connecting rod, to keep out carbon.  
Replace cylinderbase gasket every time cylinder is taken off.



6. Remove all carbon deposit from upper part of cylinder beyond limit of piston travel and clean ports, especially the exhaust port. **Take good care not to damage the edges of the ports in the barrel**, as otherwise the piston will suffer severely. Remove all burrs with a scraper and polish if necessary.

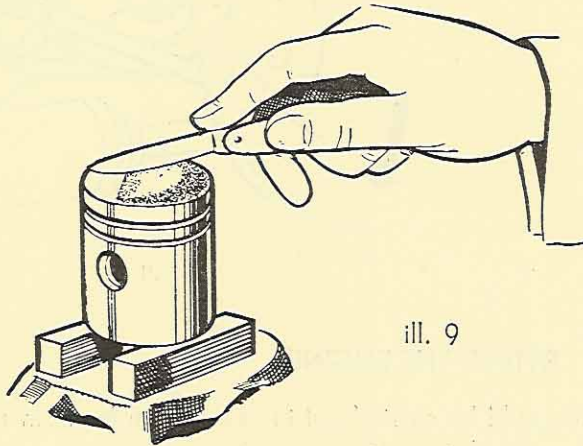
Ensure that all carbon deposit and other foreign matter is removed. This also applies to the outside of the cylinder. The best way is to wash cylinder in clean petrol after which it should be blown dry with airline.

7. Now scrape **top** (not the sides!) of piston, exercising the greatest possible care (ill. 9), and ensure that it is not scratched. **Emery cloth should not be used under any circumstances on the bearing surfaces of piston or cylinder!**

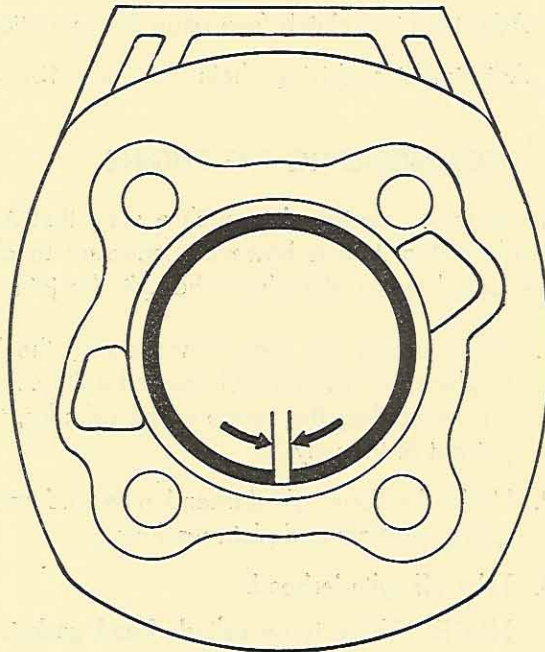
Leave brown patches on piston sides. Decarbonize piston grooves only if needed. For this purpose remove piston rings with care. Do not allow rings to become mixed: they should always be replaced in the same **identical order and position** as they were prior to dismantling. The brown side of the rings must always face the cylinder head, with the shiny surface downwards.

Carefully scrape each groove clean (a good method is to use a piece of old piston ring), as well as the back of each ring.

8. Place rings at bottom in cylinder, one at a time and check their gap (ill. 10). This should not be less than 2.8 mm (.125"), nor over 3.5 mm (.138").
9. New rings should always be checked in this way before fitting.



ill. 9



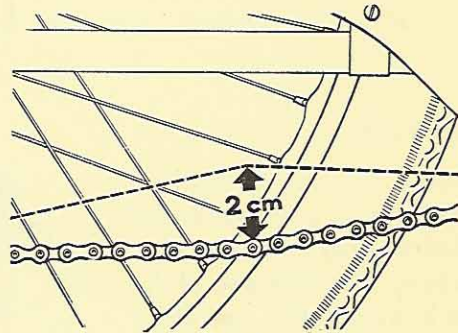
ill. 10

10. When re-assembling piston, special attention should be given to ensure that piston ring extremities are free from the locating peg and make certain that the latter is long enough.
11. Decarbonize cylinder head in the same way as piston top and polish combustion chamber with very fine emery cloth, drenched in paraffin.  
For fitting cylinder and cylinder head, see page 27 and 28, ops. 29 and 30.

## 5. ADJUSTMENT OF CHAINS

**NOTE.** First adjust bicycle chain and afterwards driving chain.

1. Loosen nuts of upper and lower engine bolt a few turns.
2. Adjust bicycle chain by means of the ordinary chain adjusters.
3. Tip engine around upper engine bolt forward (tighten) or backwards (slacken).
4. Adjust chain in such a way that it can be moved up and down approx. 2 cm ( $\frac{3}{4}$ " ) in the middle (ill. 11).
5. Secure engine in the correct position and tighten lower engine bolt properly.  
If tipping the engine requires force, place a heavy screwdriver or tyre lever between bottom part of frame and crankcase rear end.
6. Now tighten down upper engine bolt firmly and check bottom one again.



ill. 11

**Do not forget that too tight a chain could ruin it as well as the sprockets.**

## 6. THE EXHAUST

The exhaust is designed to combine a maximum of damping effect with a minimum of mechanical losses. The advantage being that it therefore requires very little attention and decarbonizing is only necessary after 2000 or 3000 miles. It is however necessary to clean the baffle, its small holes becoming clogged with soft deposit.

From the outside the fishtail can be kept free without any difficulty.

## 7. DISMANTLING AND FITTING THE IGNITION

**Dismantling:**

1. Remove flywheel nut by placing rotor steady in holes of flywheel and undoing nut with the thinwalled boxspanner (14 mm).
2. Screw flywheel extractor nr. 21 667-04 in flywheel.

**Important:**

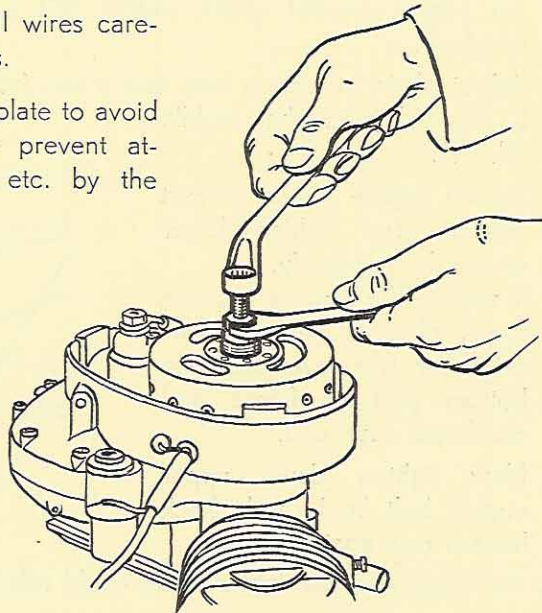
Screw extractor as deep as possible to avoid shearing the thread of both extractor and flywheel. Preferably place a thin piece of copper between



extractor bolt and centre in crankshaft to prevent the latter to become damaged.

Never use a hammer on flywheel: this will not only result in loss of magnetism but also will cause harm to the crankshaft and its bearings.

3. Hold extractor with a spanner (14 mm) and turn its bolt in clockwise direction (ill. 12).
4. Disconnect plug cable from its adapter. If engine stays in frame, disconnect lighting wire.
5. Remove with a screwdriver both screws holding base plate.
6. Take off base plate and pull wires carefully through their grommets.
7. Replace flywheel over base plate to avoid loss of magnetism and to prevent attraction of washers, nuts, etc. by the magnets.



ill. 12

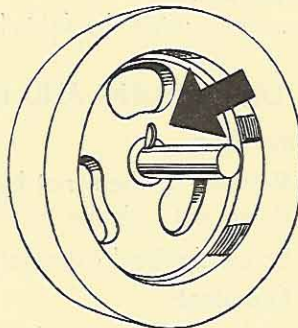
**Important:**

When replacing flywheel on crankshaft, pay particular care that **key** does not come **face to face with one of the coils during this operation**. Should the key be moved from its original position (ill. 13) the coil will be damaged beyond repair.

**Fitting:**

Before fitting the complete base plate, it is advisable to check the breaker points, condenser and both coils with their respective connections (see operation 36 on page 37).

1. Feed both cables through their rubber grommets. Do not pull cables too hard!
2. Bring base plate in its position, taking care that it does not foul one of the cables.
3. Replace both screws and tighten them by hand.



ill. 13

**Very important:**

When tightening said screws, make sure base plate

is correctly located and lies against projecting ridge, indicated with an arrow in ill. 14.

If not, flywheel will foul pole shoes of ignition coil.

For repairs, adjustment and troubles of the magneto, see operation 36 on page 37 cont.

## 8. DISMANTLING THE CLUTCH

1. Remove engine from frame (see operation 1).

Now place engine with R.H. side on bench (intake side).

Cylinderhead and cylinder can be left untouched.

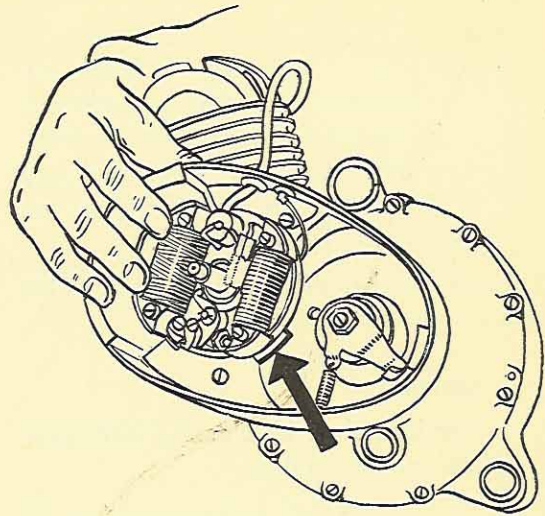
2. Remove ignition completely (operation 7) as well as both rubber grommets and rubber plug.

3. Remove clutch adjuster locknut (ill. 15), washer, bracket and 2-start screw with spindle.

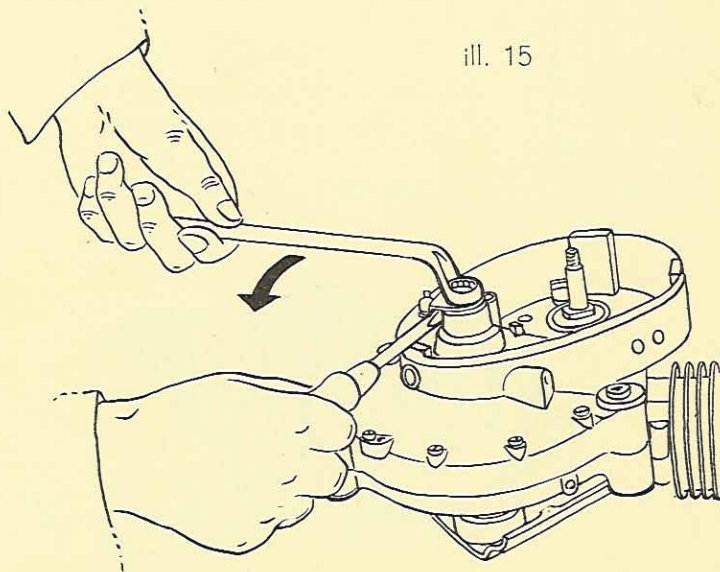
4. Drain oil from clutch housing. The easiest way to do this is when the engine is still hot, or after heating the casting (see para 7 on page 16).

5. Remove both rubber suspension bushes from casting. **In case of removing clutch housing only, leave rubber bushes in halfway.**

6. Take out screws (10).



ill. 14



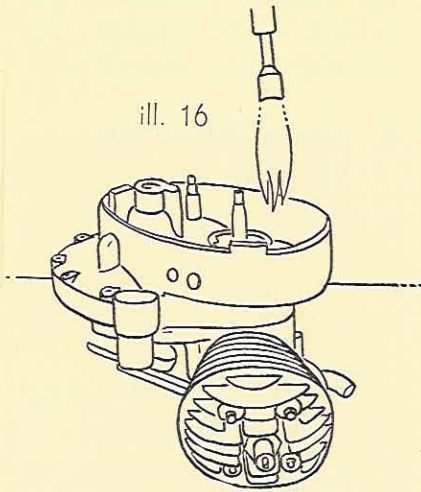
ill. 15



7. Heat casting with Bunsen burner as shown in ill 16. Never over 110° C. (For correct temperature see pag. 7).
8. Tapping casting lightly with a fibre hammer will separate it. Do not try to save paper gasket: Always use a new one!

9. Remove thrust assembly. If it will not come off easily, use two screw-drivers between the outer flange and the clutch plate. Make sure that both pins are in line and that the thrust assembly slides over them. There should be some play. For details of rectification, see page 28.

ill. 16

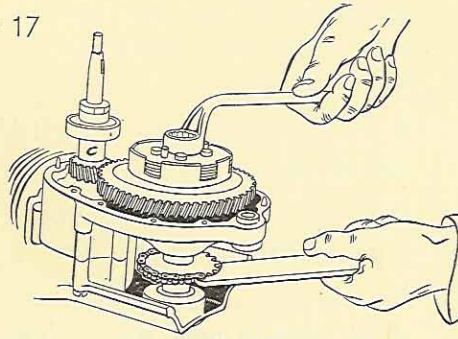


10. Lock sprocket with the aid of the sprocket spanner (see ill. 17).

**Important:**

**Never lock shaft by blocking both gear wheels nor the piston!**

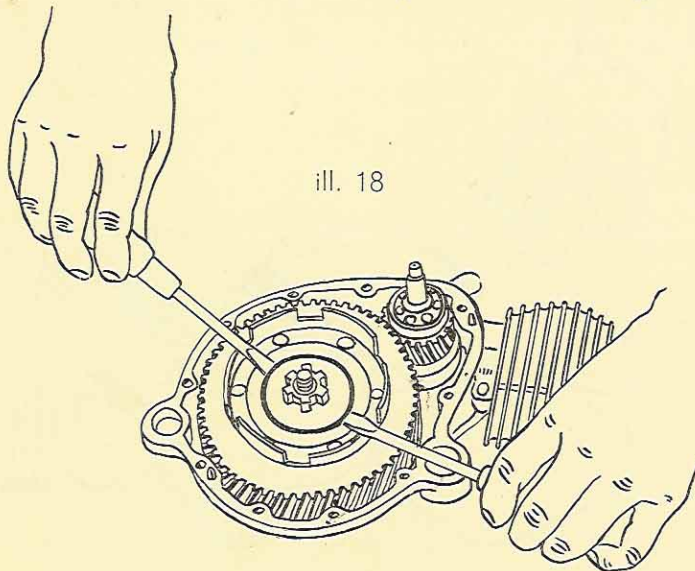
11. Undo and take off locknut (spanner 17 mm), plain washer and lock washer.
12. Lift off clutch plates. The easiest way is the whole assembly together, leaving them all in the correct order for assembly. Total thickness 16 mm ( $\frac{5}{8}$ " ) when new.
13. Remove clutch hob as shown in ill. 18, with the aid of two screw-drivers.

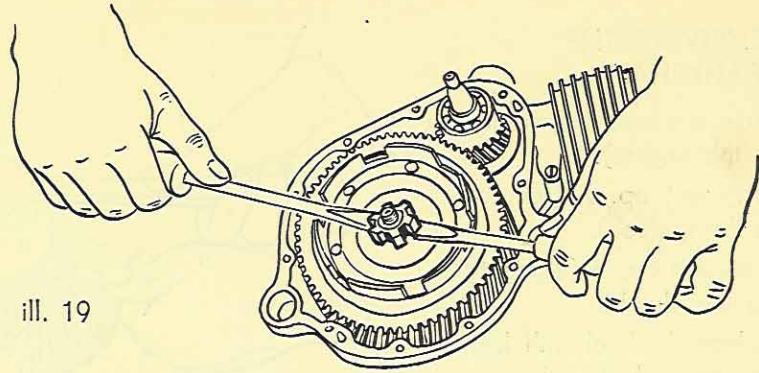


ill. 17

Lift endplate SLIGHTLY approx. 1 mm ( $\frac{3}{64}$ " ), NEVER MORE! By lifting it more, endplate is pressed against key and will be **damaged** or **bent**.

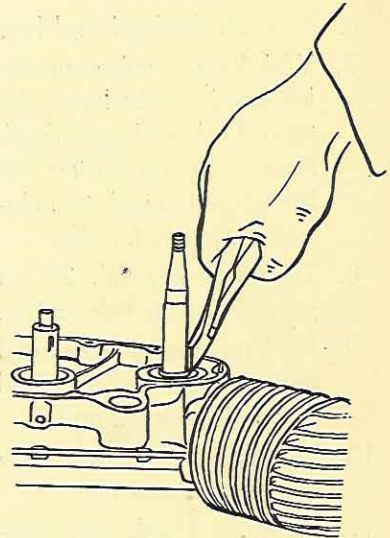
ill. 18





ill. 19

14. Now place screwdrivers **between plate and hob** (ill. 19) and ease off hob. This is a slide-fit which should **never** go too tight!
15. Remove key with side-cutter (ill. 20).
16. Take off spring pressure plate and upper steel shim-washer.
17. Remove hob-bush by moving gear wheel with drum up and down until bush appears outside wheel and can be seized by hand.
18. Remove gearwheel with drum.
19. Take off lower steel shim-washer. Check the 4 springs for tension and equal length (28,3 mm = 1,11 inch). Fit springs with grease into cups to prevent them falling out when re-building. For re-building, see page 23, operation 24.



ill. 20

## 9. DISMANTLING R.H. CRANKCASE

**NOTE.** In case R.H. crankcase should be removed only (to get at disc valve), it is not necessary to carry out operations 1, 2 and 3.

1. Carry out op. 1 (removing the engine).
2. Carry out op. 7 (removing the ignition).
3. Carry out op. 8 (dismantling the clutch).

**The above operations are only required, if the engine has to be dismantled completely. In case of a leaky disc valve only, the engine can be left in the frame.**

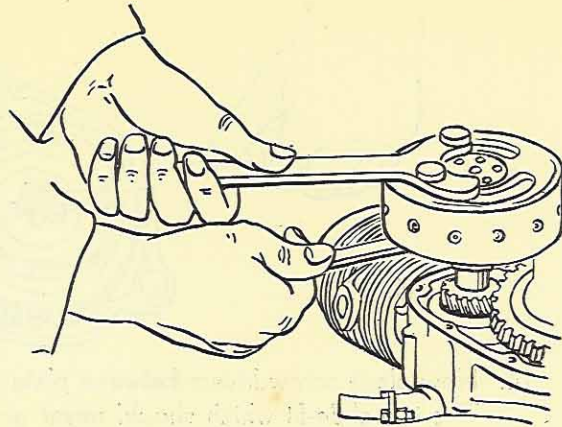
4. Carry out op. 4 (decarbonizing: removing cylinder).
5. Unscrew and take out the 6 screws.
6. Heat **whole** of the R.H. crank case to approx. 110° C. (also heat outer end of casting with hole for clutch-shaft bearing!).
7. Now take off casting by tapping it lightly with a fibre hammer. **Never use a metal hammer.**

For fitting casting, turn to page 25, op. 27.

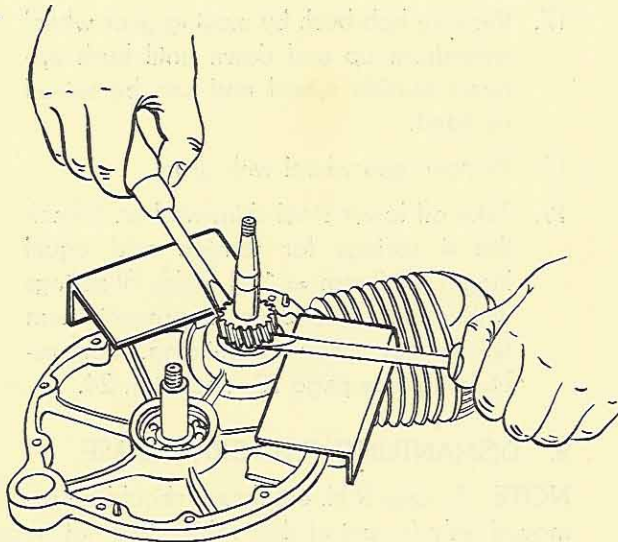


## 10. REMOVING THE CRANKSHAFT

1. Carry out op. 1 (removing the engine).
2. Carry out op. 7 (removing the ignition).
3. Carry out op. 8 (dismantling the clutch).
4. Replace flywheel with key onto crankshaft.
5. Hold flywheel with rotor steady and undo nut: **left-hand thread** (ill. 21).
6. Take off flywheel and key.
7. Withdraw subsequently: left-hand nut, ballrace, distance bush and gearwheel. Protect casting during this last operation with two aluminium plates (ill. 22).
8. Take out key (ill. 20 on page 17) with side cutter.
9. Now remove cylinder head and cylinder as described in op. 4, para's 2 and 3.
10. Withdraw R.H. crank case (op. 9 on page 17).
11. Heat L.H. crank case carefully and evenly with a gas flame as shown in ill. 23.



ill. 21



ill. 22

### Important:

On no account should the flame touch the gas and oil seal as it will be damaged beyond repair.

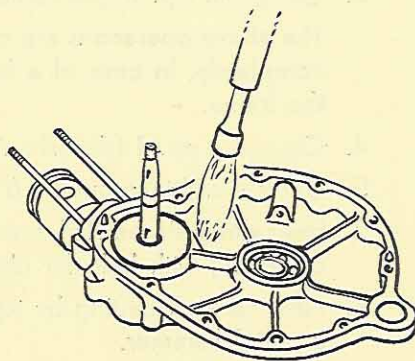
Cover seal with a large washer as shown in ill. 23.

As soon as the correct temperature is reached, the crankshaft can be taken out of the casting without any difficulty.

For fitting turn to page 25, op. 26.

## 11. CHANGING THE DRIVE SPROCKET

1. Carry out op. 1 (removing the engine).
2. Carry out op. 7 (removing the ignition).

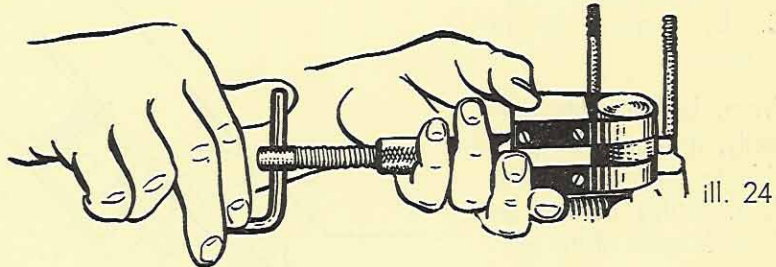


ill. 23

3. Carry out op. 8 (dismantling the clutch).
  4. Carry out op. 4 (decarbonizing: removing the cylinder).
  5. Carry out op. 9 (dismantling R.H. crank case).
  6. Having withdrawn the casting, the clutch shaft can be tapped out **cold** with the aid of a **fibre hammer**.
  7. Remove subsequently, **if necessary**:
    - a. distance bush; check whether bearing surface of gas and oil seal is not worn or scored.
    - b. drive sprocket; look for wear of key and keyway.
    - c. key; inspect key for damage or wear: replace if necessary.
    - d. nilos ring; check for wear or distortion: replace if necessary.
    - e. ballrace; check for easy running and play.
    - f. nilos ring; see d.
- For fitting turn to pages 23, 24 and 25, para's 23, 24 and 27.

## 12. REMOVING THE PISTON

1. Remove cylinder head and cylinder (op. 4, para's 1 to 6 on page 11).
2. With round-nosed pliers, take out circlips of gudgeon-pin.
3. Remove both piston rings. Never allow the rings to become mixed up and replace them in the same order and position!
4. Heat piston over a gas flame or Bunsen burner to approx. 80° C.
5. Fit extractor for gudgeon-pin over piston and press out pin swiftly.



### Important:

It is advised to mark piston crown on one side to ascertain fitting it in the identical position prior to dismantling.

Do not interchange the piston rings nor turn them upside down.

**Only remove piston or rings if it is strictly required** (for inst. when replacing gudgeon-pin or crankshaft).

**This will prevent distortion of the parts concerned.**

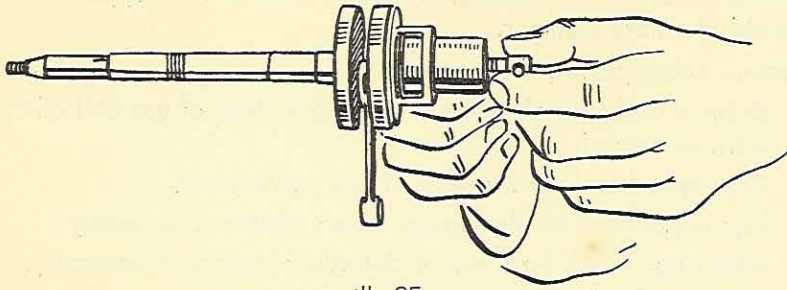
## 13. REMOVING THE BALLRACES

### Ballrace on short end of crankshaft.

1. Extractor should be screwed open as wide as possible.
2. Slide tool behind ballrace, taking care not to damage the disc valve.



3. Holding tool in one hand, turn grip in clockwise direction with other hand (ill. 25) and ballrace will be withdrawn automatically.



ill. 25

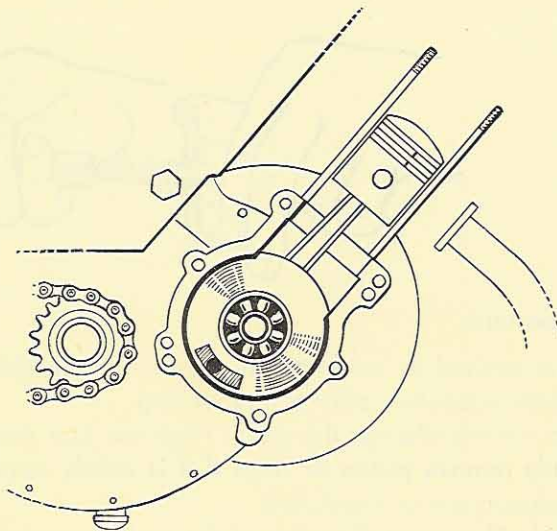
Replacing ballrace, disc valve or springs of an **assembled engine** is carried out as follows:

- a. Remove cylinder head and cylinder (op. 4, para's 1 tot 5 on page 11).
- b. Withdraw R.H. crankcase (op. 9, para's 5 tot 8 on page 17), whereafter the situation is as shown in ill. 26.
- c. Remove ballrace as described in the foregoing (ill. 25).

**Fitting in this case** should be done as follows:

1. Pre-heat ballrace to a temperature of 80 to 90° C. by placing it in boiling oil.
2. When ballrace fits correctly, it should be possible to push it onto the shaft. If this cannot be done, in spite of the correct temperature, then the shaft should be ground **very slightly** with fine emery cloth.

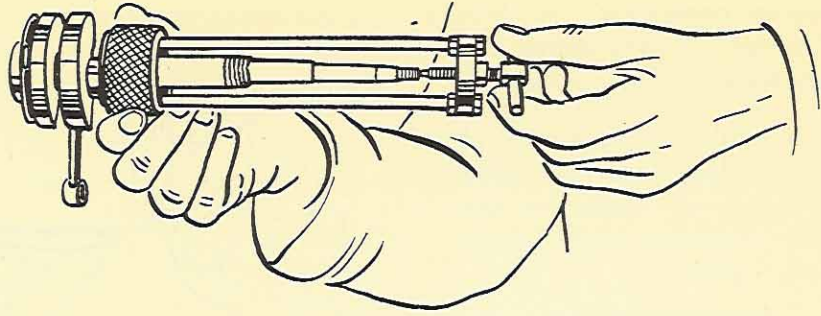
**Never strike crankshaft or ballrace with a hammer!**



ill. 26

**Ballrace on long end of crankshaft.**

1. Extractor should be screwed open as wide as possible.
2. Slide tool over ballrace as shown in ill. 27 and press knurled ring over extractor halves.



ill. 27

3. Holding assembly as done in ill. 27, race will come off, when turning grip in clockwise direction.  
For fitting, turn to page 24, op. 25.

#### SUPPLEMENTARY TASKS

##### 14. Cylinder studs.

To avoid damage of the thread in the aluminium castings, it is advised to remove studs as little as possible. If ever this thread becomes damaged, an oversize stud can be fitted.

These can be ordered from our works.

##### 15. Checking both gas and oil seals in L.H. crankcase.

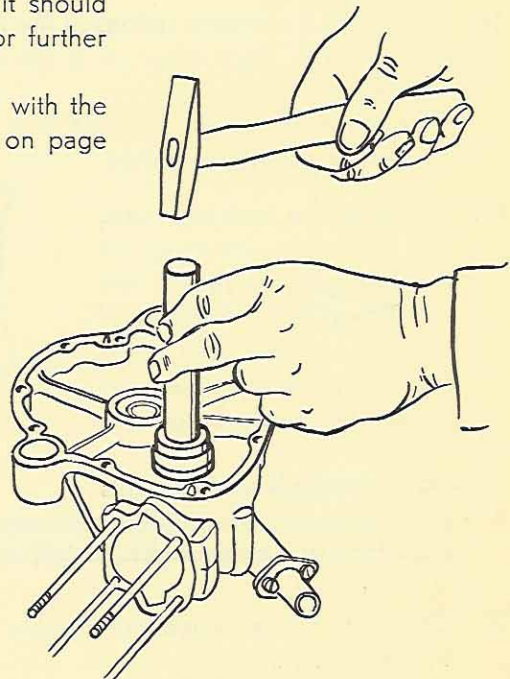
- a. Make sure rubber is in good condition and whether spiral is not damaged. Replace in case of doubt. The seal can be removed quite easily when prised out with a screwdriver. After this operation it should be discarded as it is unfit for further use.

Fitting (ill. 28) is carried out with the aid of the metal pad (ill. 3 on page 8). The seal should be inserted with the **open side facing the circlip** (the spiral always on the side of the pressure).

- b. Check circlips in crankcase for correct fitting and potential damage.

16. **Inspect all ballraces** to make sure that they run smoothly and that there is no play. Replace if condition is doubtful.

It is important to **check ball-**



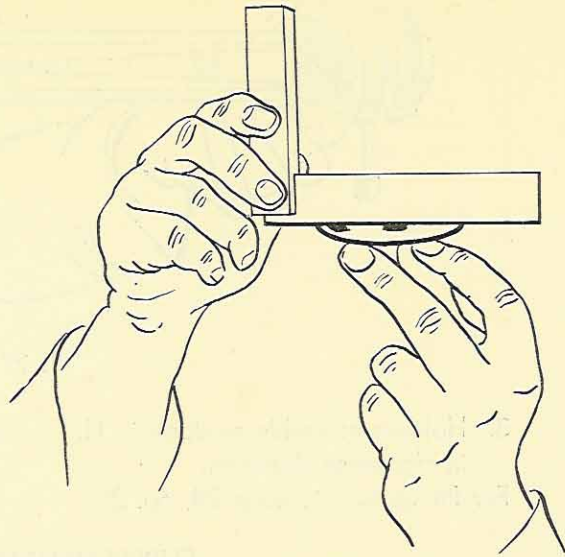
ill. 28



races continuously in their normal positions during the assembly of the engine.

17. Check the sealing qualities of the rotary induction valve (disc valve) located in the R.H. crankcase in the following manner:

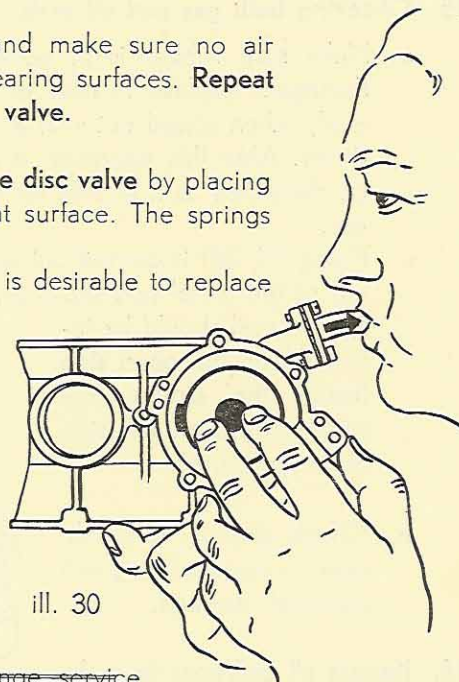
- Ascertain that disc valve is absolutely flat (ill. 29). Minor differences may be left un-corrected, but replace in doubtful circumstances.
- Very slightly oil disc valve and put it into the casting, bearing surfaces touching.
- Place an extra (thick) washer on top of valve and lightly press the assembly down by hand (ill. 30). The extra washer serves to prevent the disc valve from being bent.
- Suck** at the induction pipe and make sure no air enters, passing through the bearing surfaces. **Repeat in various positions of the disc valve.**



ill. 29

18. Inspect the 3 pressure springs of the disc valve by placing them next to each other on a flat surface. The springs must be of equal length. Free length 9,1 mm =  $\frac{23}{64}$  inch. It is desirable to replace all 3 springs at the same time.

19. Checking the cork segments. The maximum thickness of the corks should be 4,5 mm =  $\frac{23}{120}$  inch. Replace if they are worn practically flush with the steel plate, or if they are badly burned or loose.



ill. 30

~~Do not replace segments yourself. make use of the exchange service the N.V. Motorenfabriek PLUVIER offers you.~~

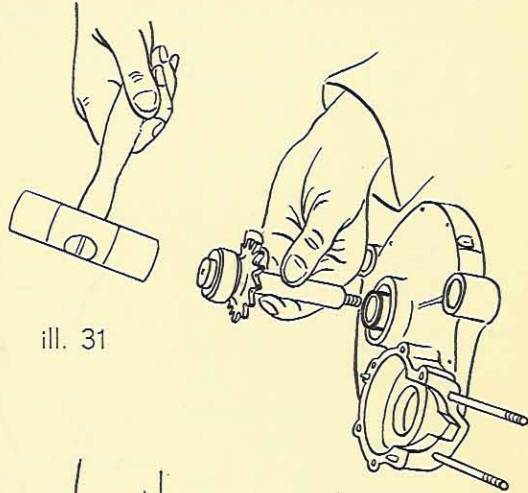
20. Check both gear wheels of primary drive for wear and/or damage and true alignment. Check also their bush, hob and and shim-washers.

21. **Checking drive chain and both sprockets.** Bear in mind that a worn chain will cause substantial harm to the sprockets. Therefore replace chain when it does not fit snugly round the sprockets anymore.
22. **Inspect crankshaft** with regard to possible wear and tear and pay particular attention to the connecting rod with regard to lateral play (max. 0,15 mm = .006 in.) and radial play (nil). Check con-rod for trueness (page 27, para's a tot e).

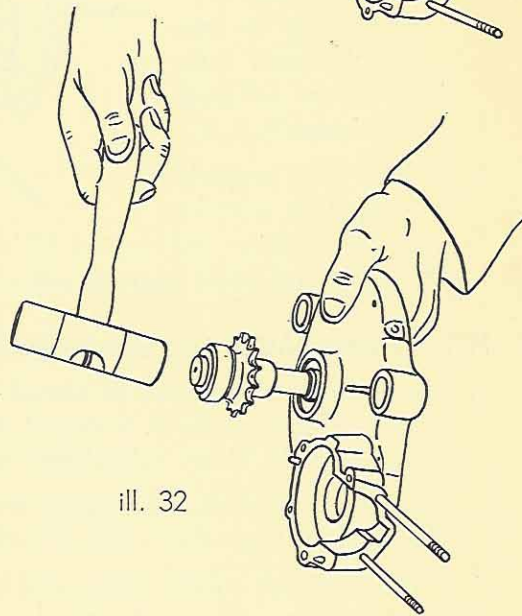
### REBUILDING THE DISMANTLED ENGINE

#### 23. Fitting the clutch shaft.

1. Fit onto clutch shaft subsequently: nilos ring, ballrace, nilos ring, key and drive sprocket. Sprocket is inserted with collar facing the ballrace (ill. 32).
2. Apply grease lavishly to double-acting gas and oil seal.
3. Place ground distance bush (not to be mistaken for the one of the clutch) into seal, as shown in ill. 31.
4. Lightly oil clutch shaft and insert it in the distance bush. In cold condition it should be lightly tapped with the fibre hammer, until it is home. Pay particular attention to key and sprocket: these must be absolutely tightly seated.



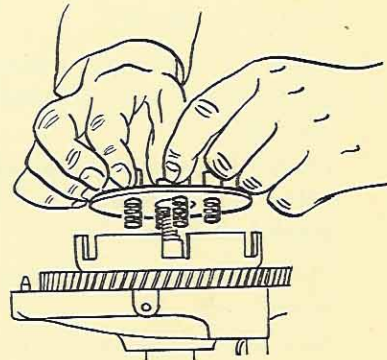
ill. 31



ill. 32

#### 24. Assembling the clutch.

1. Now fit subsequently: lower steel shim-washer, distance bush, gear-wheel with drum, upper steel shim-washer, spring pressure plate and key.
2. Fit hob.
3. Fit lower (thick) clutch

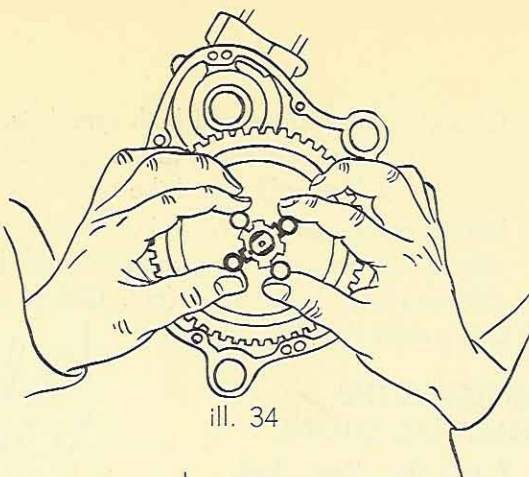


ill. 33



plate, together with cups and springs (ill. 33), **with polished side uppermost**. Springs are held into position by the previously applied grease.

Bear in mind that one of the cups should be opposite the keyway in the hob (ill. 34).



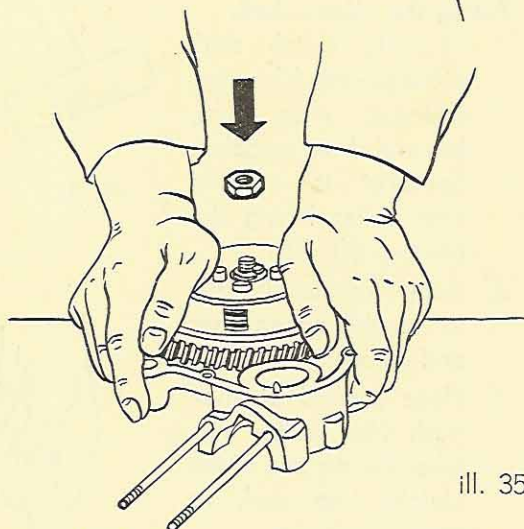
4. Now fit subsequently: cork plate, steel plate, cork plate and end-plate (pins facing upward).

5. Compress clutch plate assembly and fit plain washer, springwasher and nut (ill. 35).

Compressing the plates can be made easier by using the self-made tool on page 8, ill. 5.

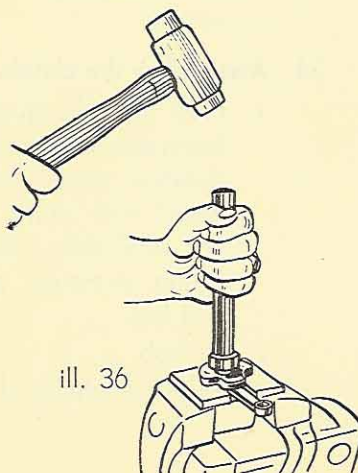
6. Tighten nut properly, holding drive sprocket with the aid of the retainer tool (ill. 4 on page 8).

**Do not fit end thrust assembly yet!** (see page 28, op. 32, para 3).



## 25. FITTING BALLRACES ON CRANKSHAFT

1. The assembly plate should be placed in between crankshaft cheeks, the long end facing upward. It should then be laid on an open vice as shown in ill. 36. Never hold cheeks in the jaws of the vice!
2. Slip race over shaft, followed by the dolly and press ballrace home. Check race to see that it runs smoothly.
3. Turn crankshaft upside down and place assembly plate between the cheeks in the same way (ill. 37).
4. Insert the 3 springs of the disc valve and place valve on crankshaft **in the right position**.  
**Do not forget that the aperture in the disc valve must correspond with the hole in the crankshaft cheek.**
5. Place dolly on the ballrace and press the latter home.  
Now check race to see if it runs smoothly

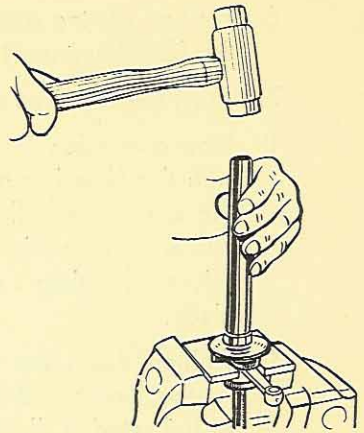


and make sure race is really "home", as otherwise the crankshaft will become pinched in between both castings.

**Important:**

If, on re-assembling, the ballraces fail to run smoothly, then they should be removed and the shaft lightly polished with fine emery cloth.

Bear in mind that the ballrace should always fit fairly tightly.

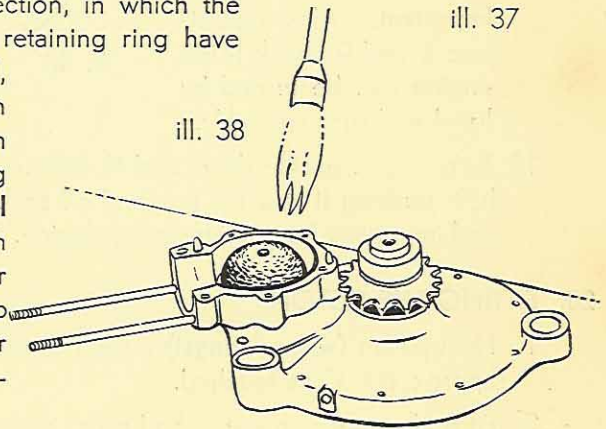


ill. 37

## 26. FITTING THE CRANKSHAFT

1. The L.H. crankcase section, in which the gas and oil seal and retaining ring have previously been fitted, should be heated in the way as shown in ill. 38. When doing this, **protect gas and oil seal** by covering it with a disc, bell-head or something similar, to prevent the rubber from scorching or burning.

ill. 38

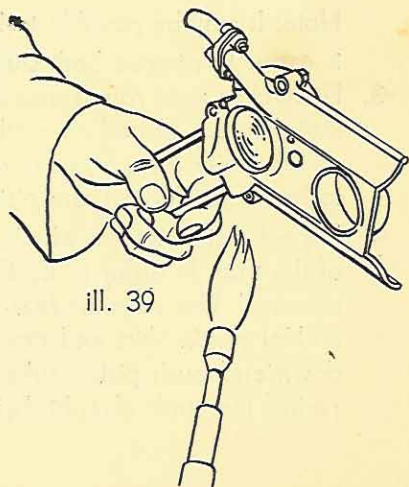


2. Fit crankshaft by passing it through the gas and oil seal and the casting.

**NOTE.** Wait before proceeding any further until casting has cooled down to body temperature. This is to ensure that the bearing will not move away from its original position.

## 27. FITTING R.H. CRANKCASE

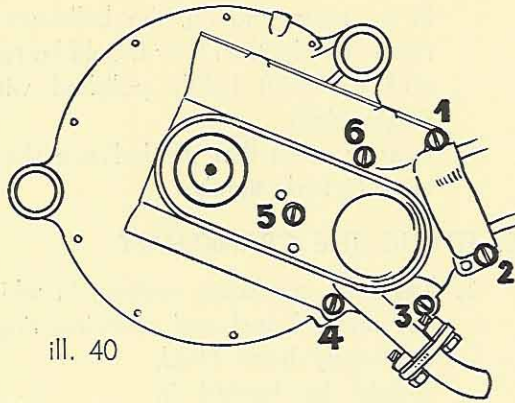
1. Before doing so, make sure the face of every casting is clean, not damaged and absolutely plane.
2. Place a new gasket onto one of the faces, to make sure it fits.
3. Dip gasket in pure linseed oil (never use motor oil nor jointing compound!).
4. Lightly oil disc valve and ballrace with oil. **No grease!**
5. Heat R.H. crank case section to a temperature of approx. 80° C. with a gas flame (ill. 39). **Ensure that the whole of the casting is evenly heated, as the ballrace of the clutch shaft should go in it at the same time.**



ill. 39



6. Position casting over both ballraces and tap it lightly and carefully with the fibre hammer, till it is home.
7. Insert the 6 screws and tighten firmly the nrs. 1 and 4 (ill. 40).
8. Now give a few short taps with the fibre hammer on the casting, to allow the ballraces to settle themselves in their proper place.
9. Tighten down the screws in the order 1-3-5-2-4-6 as indicated in ill. 40.



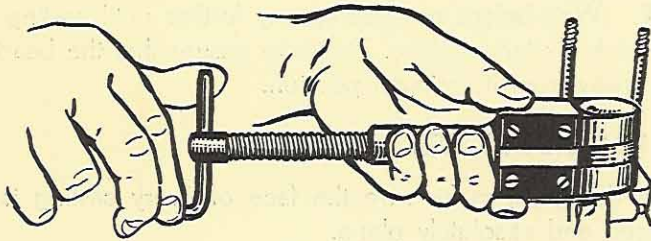
ill. 40

**Important:** After operations 8 and 9 check if the engine can be turned by hand and runs smoothly.

10. Turn engine upside down and fit distance bush on long end of crankshaft, pushing it into the gas and oil seal. This is done to prevent dust and impurities from entering the engine.

## 28. FITTING THE PISTON

1. Heat piston (**without rings!**) over a direct flame until a temperature of approx. 80° C. is reached.
2. Fit gudgeon-pin in piston and press it quickly home by using the same tool as was used for removing it (ill. 41).



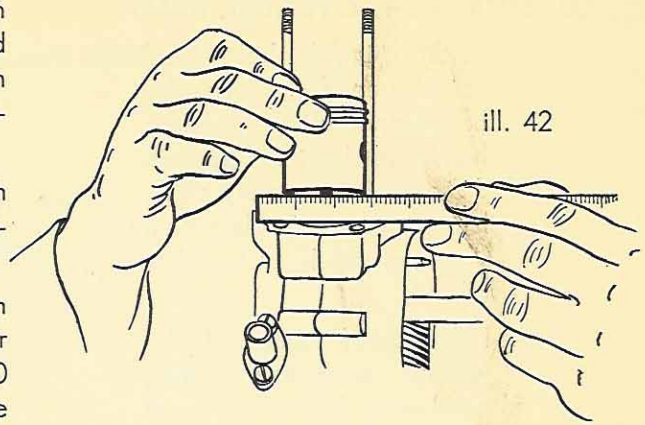
ill. 41

**Note:** It may be possible to leave the four cylinder studs in place, but it is easier to remove both studs from R.H. crankcase section.

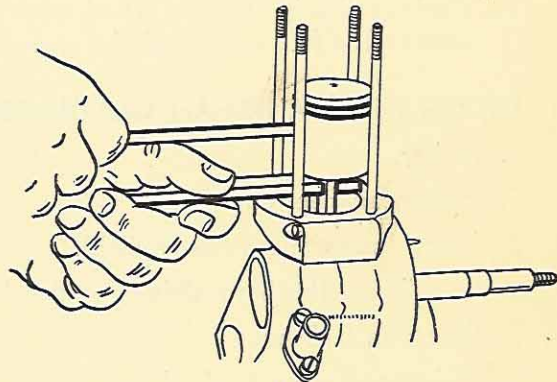
3. Fit circlips with round-nosed pliers. Pay particular attention to ensure that they are placed correctly in the appropriate grooves in the piston, as otherwise the pin may work itself loose and cause serious damage to both cylinderwall and piston.
4. Inspect piston to see whether connecting rod is not distorted nor out of the true. In order to do this, both foremost cylinder studs should be removed. Use ruler or rear-end of Columbus gauge between bottom-end of piston skirt and crankcase as indicated in ill. 42. Hold piston down and push piston subsequently to the left and to the right, comparing the streak of light between piston and ruler in either position.

If they are not equal, then re-alignment of the con-rod is required. This operation must be carried out as follows:

- a. Remove circlip on both sides with the round-nosed pliers.
- b. Pass a steel rod 8 mm ( $\frac{5}{16}$  in.) in diameter and not longer than 20 cm (8 in.) through the gudgeon-pin of the piston.
- c. Draw piston upwards.
- d. Hold con-rod with the flat sides firmly in the self-made tool (ill. 2 on page 8). **If this is not done, the big-end bearing will be damaged!**
- e. Carefully lever rod up or down, as the case may be, a fraction of an inch at the time (ill. 43), until piston angle is correct.



ill. 42



ill. 43

5. Re-fit cylinder studs.
6. Replace circlips in the piston (see page 26, para 3).

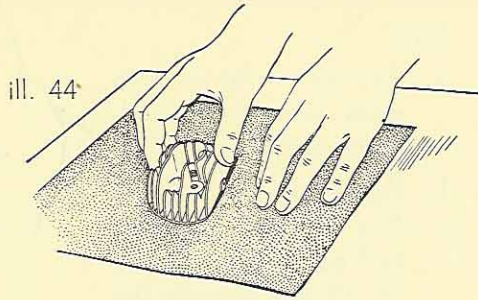
## 29. FITTING THE CYLINDER

1. Before fitting the cylinder, piston and rings should be oiled lightly, as well as the cylinder bore.
2. Grease cylinder base gasket and place it against the cylinder base.  
**Note:** Under no circumstances should jointing compound be used.
3. Place cylinder over studs and ease it over the piston crown. It is advised to draw piston up at T.D.C. and hold it there during this operation.  
**Note:** Pay particular attention in ensuring that the piston rings are correctly spaced with regard to the locating pins.
4. Compress uppermost piston ring enabling it to get inside the chamfered end and carefully push cylinder over it. Treat bottom ring the same way.
5. Continue to push cylinder downward until it comes to rest against the crankcase.



### 30. FITTING THE CYLINDER HEAD

1. Before fitting the head, the facing should be inspected to see that it is not damaged. In case this has happened, the cylinder head must be trued up with the aid of fine emery cloth, laid on a surface plate or a sheet of thick plate glass (ill. 44).
2. Place head over cylinder **without using any jointing compound**, but a light touch of graphite grease on the bearing surface.
3. Washers should then be fitted over the studs, followed by spring washers. The four nuts should be screwed down evenly in turn.

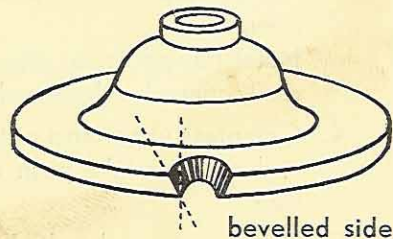


### 31. FITTING THE CRANKSHAFT GEARWHEEL

1. Fit key.
2. Push gearwheel onto shaft.
3. Insert distance bush (un-finished).
4. Fit ballrace. This has a **slide-fit** on the shaft.
5. Screw on L.H. nut.
6. Fit key and place flywheel over it.
7. Use flywheel as retainer and tighten down nut **firmly** (compare ill. 21 on page 18).
8. Remove flywheel and take out key.

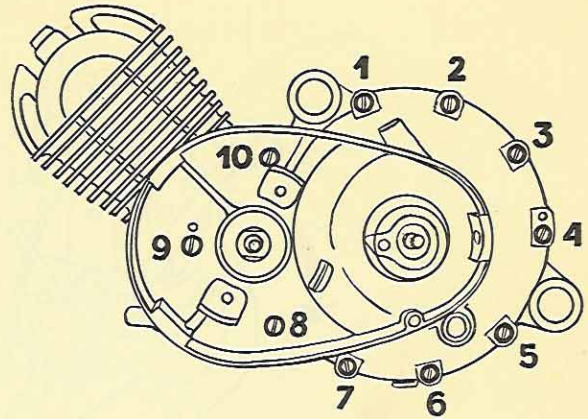
### 32. FITTING THE CLUTCH HOUSING

1. Make sure both surfaces are clean and undamaged. First of all put gasket over L.H. (central) casting to make sure gasket will fit.
2. Dip gasket in pure linseed oil and fit it in the correct position.
3. **Now place and-thrust assembly onto the assembled plates.** Check whether it can be moved up and down at least  $1\frac{1}{2}$  mm ( $\frac{1}{16}$  in.) and does slide smoothly. In the last case, both apertures should be filed out a little towards the centers as indicated in ill. 45.
4. Make sure air vent in L.H. casting is open.
5. Heat casting over a flame to approx.  $110^{\circ}$  C.
6. Drop casting over clutch and ball-race, if needed, tapping it lightly with the fibre hammer.

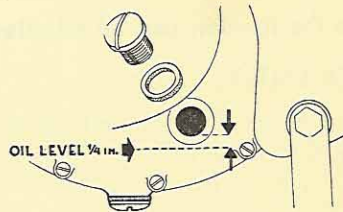


ill. 45

7. Insert the screws and tighten nrs. 2-10-6 (ill. 46) firmly.
8. With fibre hammer tap casting a few times near ballrace and on slope around the clutch. Now tighten screws firmly in the order 1-3-5-7-9-2-4-6-8-10.
9. Remove filler plug and fill housing with 65 cc motoroil SAE 30-40 to a level  $\frac{1}{4}$  inch under opening (see ill. 47).
10. Fit and screw tight filler plug and secure bottom (drain)plug.
11. Insert both rubber grommets and rubber stop: Plug lead grommet foremost.



ill. 46



ill. 47

### 33. FITTING ENGINE SUSPENSION

Now put into position subsequently the resilient bushing together with its metal distance bush. The **long metal bush** goes in **topmost**. Check whether resilient bushings of the bottom bolt are not too long. If so, cut off 2 mm (approx.  $\frac{5}{64}$  in.).

Offer engine to frame and look for the correct order of the washers:

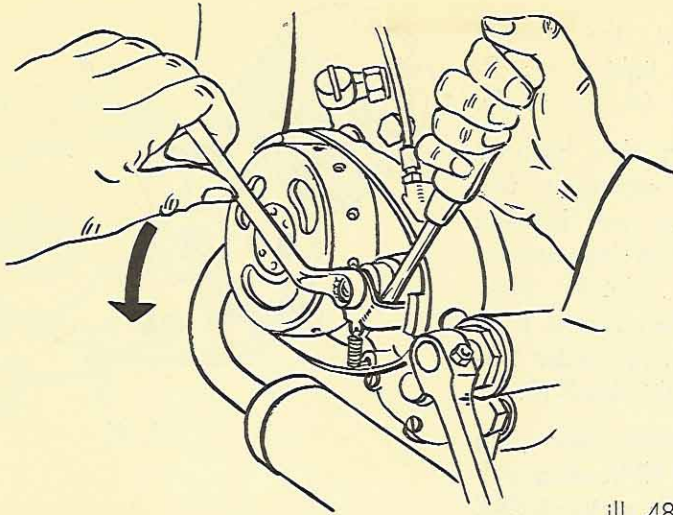
**Bottom:** Two equal washers on each side. The **thick** washers facing the resilient bushings, the chromium plated ones on the outside of the frame.

**Top:** The washers with spigot-grooves must face the resilient bushings, the grooves should mate with the distance bush. Compare Parts List page 1.

### 34. ADJUSTING THE CLUTCH

1. Screw cable adjuster into casting as far as it will go.
  2. Slacken lock nut of adjuster screw (ill. 48).
  3. With screwdriver, turn adjuster so that clutch lever on the handlebars has approx. 1 mm ( $\frac{3}{64}$  in.) free travel.
  4. Secure locknut (ill. 49).
- Final adjustment can be done with the aid of the cable adjuster screw.
- Note:** Lubricate clutch cable occasionally, preferably once every 3 months. Apply some tough grease at the ferrules, to prevent penetration of water.



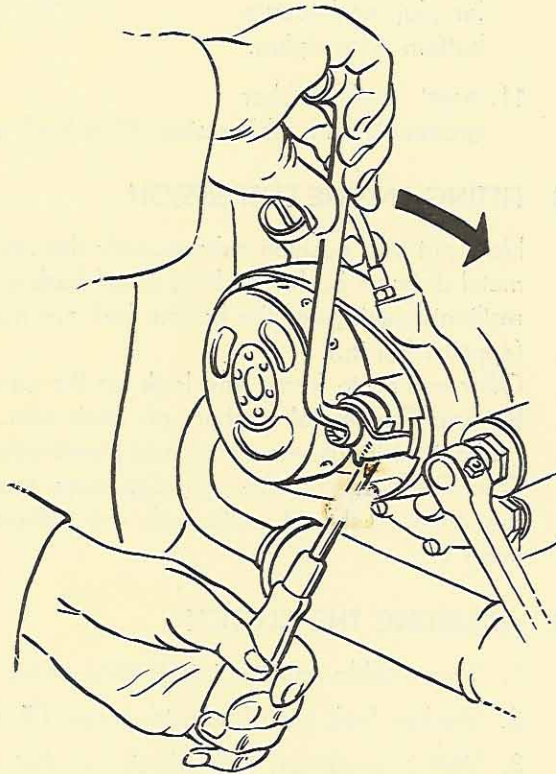


ill. 48

At this stage the ignition can be adjusted (see pag. 40).

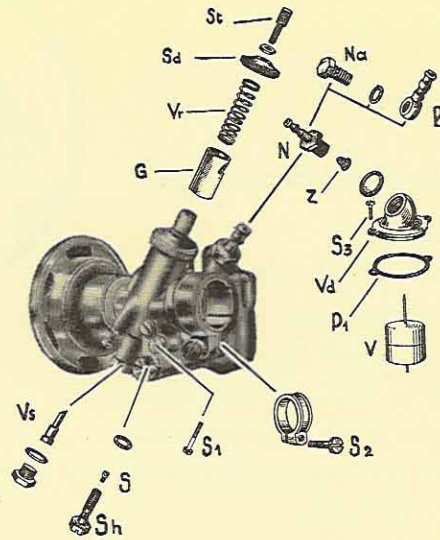
#### FIT SUBSEQUENTLY:

1. Magneto cover. Do not omit rubber ring behind it. On models with grommets on top of the casting, the cables should be waterproofed with solution.
2. Carburetter. Check adjustment of starting device (automatic choke) before fitting (turn to pages 33 and 34, para's 6 and 7).
3. Chain guard.
4. Right hand pedal.
5. Rubber cable clips (3).
6. Adjust bicycle chain first.
7. Now adjust drive chain (page 13, para's 1-7).
8. Check operation of coaster hub and **lubricate it freely on every occasion** (Shell Spirax E.P. 90). See operation 39 on page 49 and cont.
9. Road test.
10. When the engine is hot, tighten the crankcase screws and cylinder head nuts again.



ill. 49

### 35. ENCARWI CARBURETTOR



ill. 50

1. Previous models have been fitted with a type shown in ill. 50. Later models are equipped with the type shown in ill. 51.

In all types the automatic choke is incorporated, and described on the following pages.

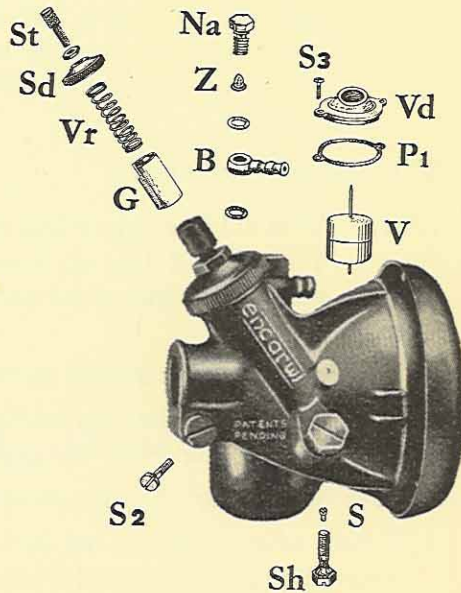
On the handlebars the twistgrip controls the operation of both the road speed and the automatic choke, separated by a locking device.

The choke is put into operation by pressing the small lever on the twistgrip and thereafter again turning the grip further towards the right (ill. 52).

When twisting the grip to the left (opening the throttle), a "click" is heard after about  $\frac{1}{4}$  turn. This click indicates the 0-position, in which all gas supply is cut off.

The carburettor (ill. 50) consists mainly of 3 parts:

1. Floatchamber (containing the float with needle), with its cover in which is located the needle seating.
2. Mixing chamber with atomiser.
3. Airfilter.

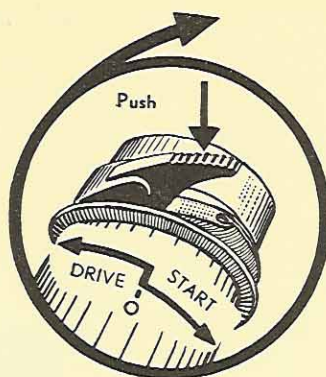


ill. 51



The later type carburettor (ill. 51) consists of 1 part, incorporating all parts mentioned before.

On both models, the petrol inlet in the float chamber cover should be facing the rear of the bicycle (backward).



ill. 52

## 2. Removing carburettor from induction pipe.

- a. Close petrol tap.
- b. Unscrew clamp screw S2 a few turns.
- c. Put twist grip in starting position.
- d. Disconnect rubber petrol pipe from tap: apply a screwdriver and prise pipe off tap.
- e. Remove carburettor from induction pipe.
- f. Unscrew and take off mixing chamber top Sd, pulling out the throttle valve by the Bowden cable.

**NOTE.** Take care to protect valve from contacting sand and dirt. Refitting in the reversed order. **Make sure induction pipe is as far into carburettor as it will go.**

## 3. Checking petrol filter.

- a. Filter Z is located in banjo bolt Na. Remove bolt with a spanner of 11 mm.
- b. Take out filter by hand (nails).
- c. Rinse it in clean petrol and apply airline.

**NOTE.** Make sure filter has a tight fit in banjo bolt when refitting both parts, as it will work itself loose. To obtain the required fit, pinch filter lengthwise carefully between thumb and index finger. Also check fibre washers and replace these when damaged.

## 4. Checking float and needle.

**NOTE.** **With old type only:** If float chamber top has to be dismantled, without having to take out banjo bolt, the latter must nevertheless be removed, as one of the holding screws can not be reached otherwise.

- a. Unscrew and take out both screws S3.
- b. Remove float chamber top, taking good care not to damage gasket P1. The best way is to renew the gasket every time top is taken off.
- c. Take out float by lifting it vertically by the needle.
- d. Check whether float is not leaking by submerging it in nearly boiling water. If bubbles come to the surface, it is obvious that float is punctured. **In this case replace the complete float assembly and do not try to solder.**

- e. Clean inside of float chamber with pure petrol and make sure guide in bottom of chamber does not contain impurities. Remove these with the aid of a fitting drill (1,8 mm =  $\frac{1}{16}$  in.).
- f. Check needle for wear and damage and be certain pointed end is straight. This goes for its seating too.  
Inspect both carefully, **preferably with a magnifying glass**, and look for signs of wear: It may be that the needle does no longer fit its seating, due to wear.

#### 5. Checking the jet.

- a. Remove jetholder Sh.
- b. Take out jet with a fitting screwdriver.  
**IMPORTANT:** Never use a sharp metal object to poke through the jet, causing the jet to loose its calibration.  
Apply airline, but blow **against the normal flow of the petrol!**
- c. **Old type only:** Check while refitting jetholder whether fibre washer is still in good order. If not, replace washers.

#### 6. Checking the automatic choke.

The automatic choke, designed to make cold starting easy, operates as follows:

If the twistgrip is turned in starting position (ill. 52), the throttle valve is lowered, thus enveloping the end of the atomiser, protruding into the venturi. In the throttle valve is a very small passage, which, in this position, is immediately opposite the atomiser. Also the semi-circular opening in the valve is visible from the side of the induction pipe. See ill. 53 C.

#### Operation.

If the semi-circular opening is facing the induction side, the vacuum over the valve is very substantial. As a result of this, petrol is drawn up via the atomiser and the small passage in the valve itself. The amount of air mixed with this petrol, is therefore rather small, making the mixture richer and thus assisting an easy starting of the engine.

**NOTE.** In very cold weather easy starting can be obtained by leaning the bicycle over with the float chamber higher than the mixing chamber, causing the carburettor to flood.

#### 7. Adjusting the automatic choke.

The only correct method is as follows:

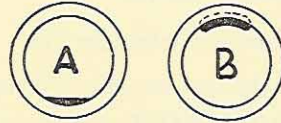
- a. Unscrew cable adjuster St in <sup>mixing</sup> ~~float~~ chamber top and leave it in midway position.
- b. Place twist grip in starting position (operation 1 and 6).
- c. Undo screw in grip holding throttle cable, causing the throttle valve to go down as far as it will go, due to the spring pressure.



- d. Now adjust cable in such a way, that there is a free movement of  $\frac{1}{2}$  to 1 mm ( $\frac{1}{64}$  to  $\frac{3}{64}$  in.) between cable ferrule and cable elbow.
- e. In this correct, thighten screw, locking cable firmly.
- f. Open up throttle and close it again to 0-position.
- g. Look into mixing chamber from the side of the induction pipe. If throttle valve is adjusted properly, it will close the venturi completely, as shown in ill. 53 D. If not, correct it with the aid of the cable adjuster.

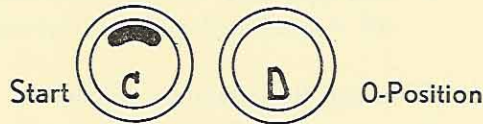
The bottom end of the valve should be approx. 1 mm (just over  $\frac{1}{32}$  in.) beyond the culvert of the mixing chamber. If valve is too far down, a portion of the semi-circular opening will be visible.

**NOTE.** Adjust throttle valve in such a way that the semi-circular opening is fully visible in the starting position (ill. 53 C), but in 0-position the valve will close the culvert absolutely (see ill. 53 D).



**WRONG**

**THROTTLE VALVE HIGH**  
SCREW IN ADJUSTER



**CORRECT**

ill. 53

**8. Cleaning the airfilter.**

**Old type:** Here the filter is not detachable and cleaning can only be carried out by rinsing it thoroughly in clean petrol. Apply airline and repeat these operations a few times, if necessary. Before fitting the filter, lightly oil the filter element.

**New type:** This filter is completely detachable, so the element can be easily cleaned. Do this in the same way as described before.

The above cleaning operation should be carried out every 1000 km = 650 miles.

## TROUBLES

In general, the following troubles with the carburettor may occur:

- A. Flooding.
- B. Engine fails to start.
- C. Engine dies suddenly.
- D. Engine doesnot pull.
- E. Four-stroking.
- F. Engine will not pick up revolutions.
- G. Leakages.

A. **Flooding of the carburettor** is mainly caused by the following reasons:

1. Float needle sticks in its guide on the bottom of the float chamber (see 4). Sticking may also be caused due to roughness of the lower part of the needle, as a result of soldering tin, or anything else. Polish this end of needle with fine emery cloth.
2. A foreign object between point of the needle and its seating, preventing needle from closing with the seat. Clean the parts mentioned and check petrol filter in banjo (See 4 and 3).
3. Worn seating and/or needle. Replacement is the only solution.
4. Leaking float: replace.
5. Too high a level. This seldom happens, but there is sometimes a chance that the **top part** of the needle is **too short**. Compare needle with a spare one.
6. Carburettor fitted at an angle.

B. **Engine fails to start.**

1. Blocked jet (see 5).
2. Petrol passages dirty, causing poor supply of petrol. To check flow of petrol, unscrew and take out jet holder with jet. If there is no petrol streaming out (open tap!) or only a faint trickle, it indicates, that either the strainer in the banjo or the tap is blocked.
3. Too narrow a passage between base of strainer and bottom of hole in bottom of float chamber cover. This is mostly due to the fibre washer being too thin. Fit 2 washers or file off  $\frac{1}{2}$  mm ( $\pm \frac{1}{64}$  in.) of bottom end of banjo bolt.
4. Sticking throttle valve, preventing it to be lowered fully, in which case the valve fails to reach the starting position.
5. It is also possible that the starting position cannot be reached, because of the cable adjuster being screwed too far out (see 6).



**C. Engine splutters and dies.**

1. Lack of fuel: Refill.
2. Blocked jet (see 5).

**D. Engine doesnot pull.**

This may occur as a result of too small a jet, but mostly the cause lies somewhere else (carbon deposit, leaking gas and oil seal, leaking disc valve, faulty ignition timing, etc.).

**E. Engine runs four-stroke.**

This may be caused by too large a main jet or defective float, premised that the **interior of the engine** and **exhaust** are absolutely **free of carbon**.

**F. Engine will not pick up revolutions.**

This is the result of an insufficient petrol supply. Causes:

1. Air vent in filler cap blocked.
2. Both petrol strainers dirty.
3. Impurities in float chamber and/or jet.
4. Insufficient passage for the fuel in float chamber cover.

**G. Leakages.**

These are mostly the result of faulty gaskets or washers.

**Old type:** Especially the gasket between mixing chamber and float chamber is often insufficiently tight. This gasket should always be replaced by a new one after taking both halves apart, as it is usually damaged after this operation.

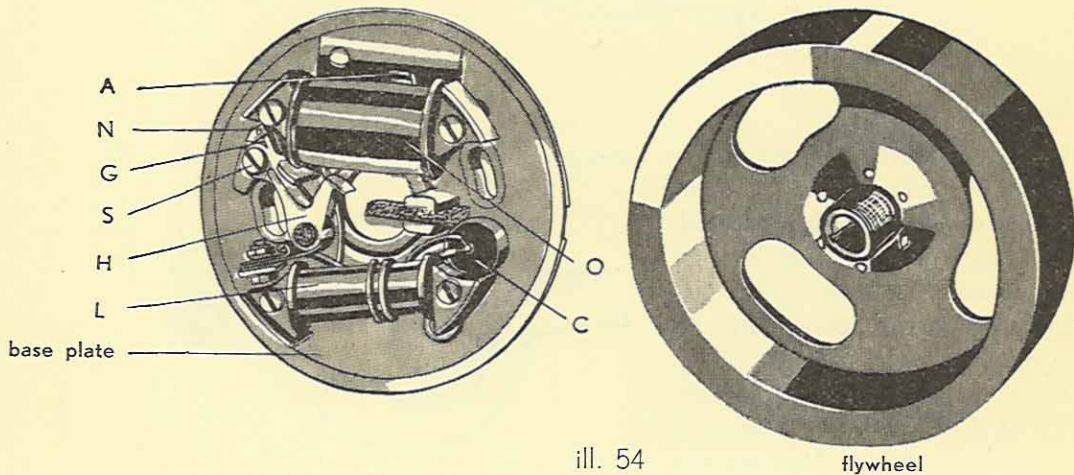
**New type:** The jet holder has no gasket, but a ground sealing edge. In case of leakage through this edge, it is advisable to re-grind it, or to place a fibre washer over it.

## 36. BOSCH IGNITION

Types: LM/UP 1/115/8 R1 (8 Watts)  
LM/UP 1/115/17 R9 (17 Watts)

The complete magneto (ill. 54) consists of the following separate parts:

1. The flywheel (rotor), with breaker cam riveted on it.
2. The base plate.



### 1. The flywheel.

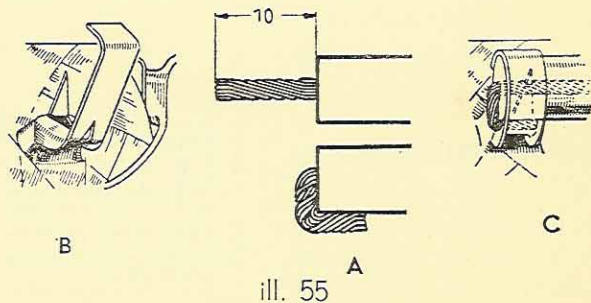
The flywheel contains 6 built-in magnets and this assembly is truly balanced. It is therefore essential to handle the flywheel with care and never to hit it with a hammer when dismantling or fitting it.

ALWAYS USE THE SPECIAL FLYWHEEL EXTRACTOR.

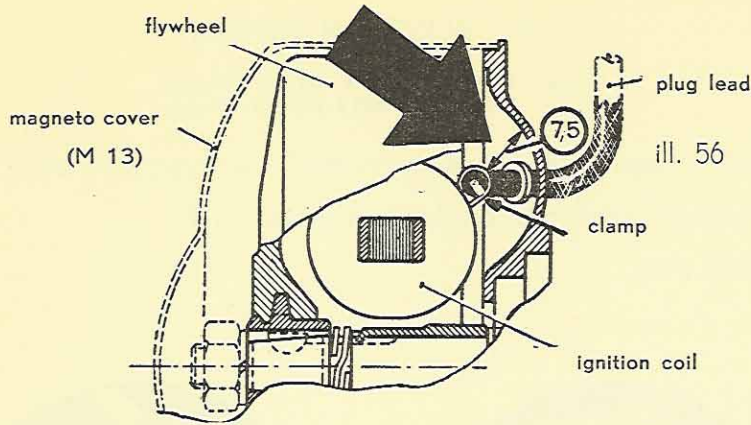
Due to hitting or falling, the magnetism of the magnets may diminish.

### 2. The base plate.

Hereon are fitted the ignition coil O, the condenser C, partially built into the plate, the contact breaker consisting of a contact plate and a breaker hammer H, and the lighting coil L.



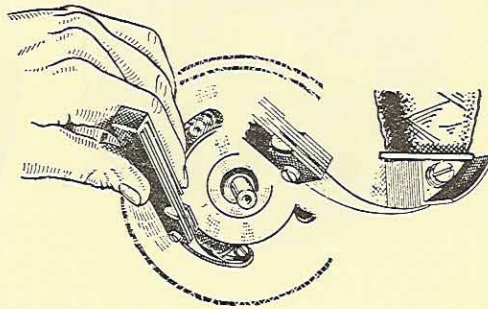




**The ignition coil.**

Here it is important to pay attention to the plug lead. This connection should **never** be soldered. The means of attaching lead to coil is such, that even without soldering a proper connection can be made (ill. 55).

The correct method is, by removing 1 cm of the insulation of the cable (ill. 55 A). After this the cable core is bent backward and pressed into the thorn (ill. 55 B) of the clamp A (ill. 54) on the ignition coil. The rest of the clamp is folded around the cable and squeezed with a pair of pliers (ill. 55 C).

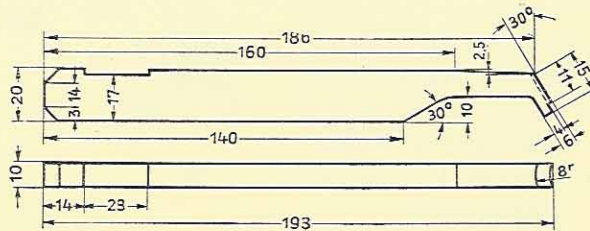


**Take good care that no loose strands of the core are outside the clamp, as otherwise the spark will jump toward mass.** Never push, pull or twist clamp, causing substantial damage to the interior of the coil (connection secondary winding/clamp).

**DURING THESE OPERATIONS, DO NOT DAMAGE THE COIL INSULATION.**

Take into account, that the distance between this connection and the mass (base plate) should **never** be under 7,5 mm ( $\frac{19}{64}$  in.) as shown in ill. 56. If however a spark jumps this distance nevertheless, the spark plug electrodes will be too far apart. Adjust these at 0,40 to 0,45 mm (.016 to .018 in.).

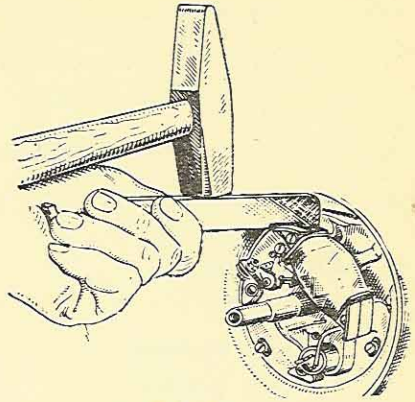
ill. 58



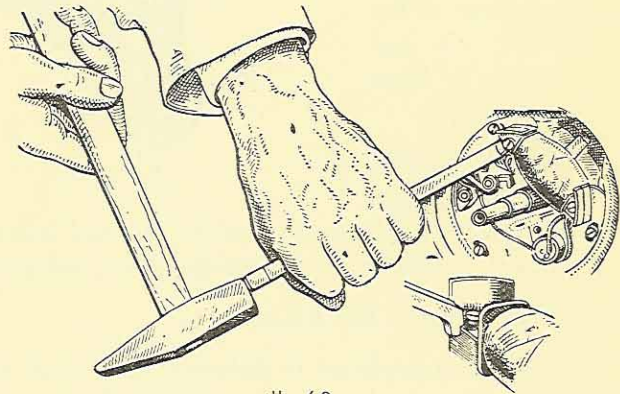
**IMPORTANT:** In case lighting coil or ignition coil have been replaced, it is necessary to check whether the pole shoes do not foul the inside of

the flywheel and whether the air gap is not too wide. The correct distance between shoes and flywheel should be 0,25 tot 0,30 mm (.0098 to .012 in.). Carry out check as follows:

1. Fit coil but do not tighten screws right down.
2. Fit flywheel and tighten nut by hand, to hold flywheel on crankshaft without wobbling.
3. With the aid of a feeler gauge of the abovementioned thickness, measure gap between shoes and flywheel, via one of the apertures therein (ill. 57).
4. In case gap is too narrow, take off flywheel and tap coil in the direction of the crankshaft (ill. 59). Always use special tool (ill. 58) and **place it against the core** and not against the shoe-extension.



ill. 59



ill. 60

5. If gap is too large, place tool at **bottom end against the core**, and tap coil in the direction away from the crankshaft (ill. 60).
6. After operations 4 and 5, the flywheel should be fitted again, to check if gap is correct (see operations 2 and 3).

#### The contactbreaker.

The contactbreaker is held to the base plate with one screw, ~~which also holds the base plate to the crankcase (see later)~~. It is very important that while repairing or checking the ignition, no dirt or dust can get at the cam or fibre block of the hammer H. If this happens, the fibre will wear abnormally quickly and premature replacement of the hammer is necessary, apart from the fact that the spark formation will worsen.

The oil wick for the cam is originally impregnated with tough grease, but after approx. 10,000 miles it should be replaced by a new one. Intermediate lubrication with oil of the wick may cause failure of the breaker points, due to oil fouling them, the result being no spark at the plug.

KEEP CONTACTBREAKER ALWAYS CLEAN AND FREE FROM OIL.



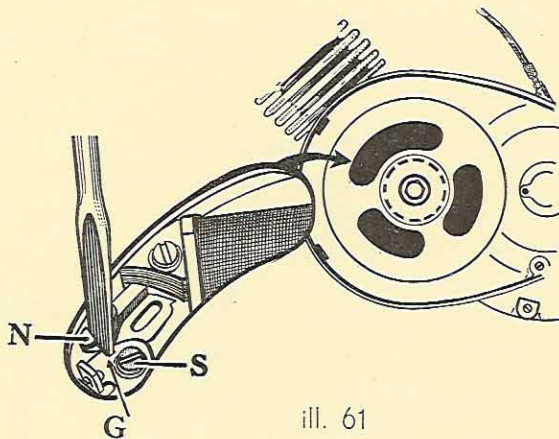
### Adjusting the ignition.

This consists mainly of two operations, which should **always** be carried out in the order described hereafter:

- A. Adjustment of the contact breaker gap.
- B. Setting the timing.

#### A. Adjusting the breaker gap.

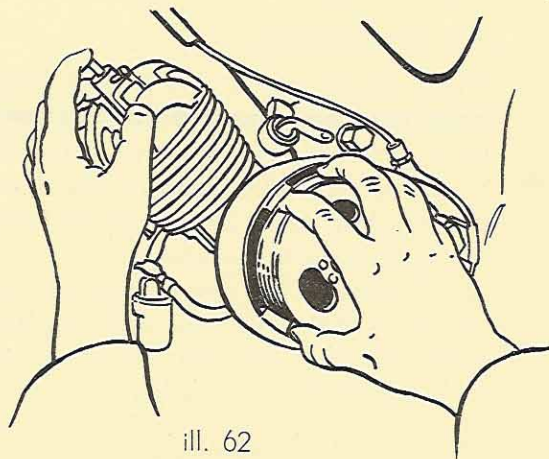
1. Place flywheel in the position as indicated in ill. 61. Now the hammer is lifted clear of the plate, the gap being as large as possible.
2. Check whether a feeler gauge of 0,45 mm (.018) in.) can be inserted between the opened breaker points. If adjustment is necessary, proceed as follows:
  3. Undo screw S half a turn.
  4. Place a screwdriver in between both studs N on the base plate and notch G in the fixed contact (ill. 61). By turning screwdriver in clockwise direction (direction of rotation), the breaker gap is made wider.
  5. As soon as the correct setting is attained, tighten screw S.
  6. **Always** check gap again, after this, as the gap may have altered by doing up screw S.



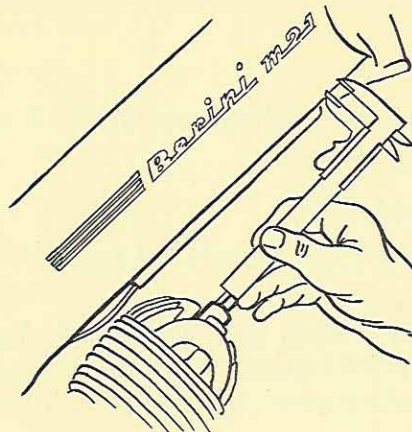
ill. 61

#### B. Adjusting the ignition timing.

1. Set breaker points at 0,40 to 0,45 mm (.016 to .018 in.), if this has not been already done.
2. Remove spark plug.
3. Fit timing adjuster tool in spark plug hole.
4. Find T.D.C. of piston (ill. 62).



ill. 62



ill. 63

5. Measure length of the adjusting pin with the Columbus gauge (ill. 63).
6. Give flywheel half a turn in the **opposite** direction of rotation.
7. Set adjusting pin 2 mm ( $\frac{5}{16}$  in.) deeper into the cylinder (USE COLUMBUS GAUGE) and lock pin with the retaining screw.
8. Turn flywheel very carefully in its normal direction, until piston runs against the pin.
9. Now place a cigarette paper between the contact breaker points. The paper will be held fast between the points.
10. Loosen both screws holding base plate, until plate can be turned by hand.
11. Rotate base plate slowly and carefully **against direction** of rotation of the engine (anti clock wise). Apply slight pressure at the same time to the cigarette paper to withdraw it.
12. Stop turning base plate at the moment the paper is released.
13. Tighten both screws of the base plate firmly.
14. Check the adjustment and breaker gap again after rotating the engine a few turns.

**IMPORTANT:**

1. Make sure no paper remnants are left in between the breaker points. No spark will then be produced!
2. When pulling the flywheel off the crankshaft, make sure extractor is screwed far enough into the flywheel, as otherwise both threads may be sheared.



3. When fitting flywheel, pay attention to the key and make sure it has not been pushed out of its key way (ill. 13 on page 14). Preferably **keep key way sideways**, thus rendering it impossible for the key to damage one of the coils.

#### Locating troubles.

When locating ignition troubles, always separate the 2 causes, i.e.:

A. Faults in the magneto itself.

B. Faults in the accessories.

Systematic procedure is the best and quickest method and is carried out in the following order:

1. Check if a spark is present, by disconnecting plug lead from the plug adapter. Hold end of lead approx. 4 mm ( $\frac{5}{32}$  in.) away from the mass and rotate engine at starting speed (take out plug, if needed). A spark should now jump to mass.
2. If spark remains absent, inspect lead for fractures or leaks. File breaker points, clean them with pure, clean petrol and set them at 0,40 to 0,45 mm (.016 to .018 inch).
3. If there is a spark, the plug is at fault. Clean plug or replace it by a new one. Set electrodes at 0,40 to 0,45 mm (.016 to .018 inch).
4. Test ignition coil separately (without any connections). If coil is O.K., the fault is caused by the condenser.
6. Test condenser separately (without any connections). If condenser is O.K. the coil is faulty.

#### IMPORTANT:

Make absolutely sure that all connections are properly tightened and/or thoroughly soldered.



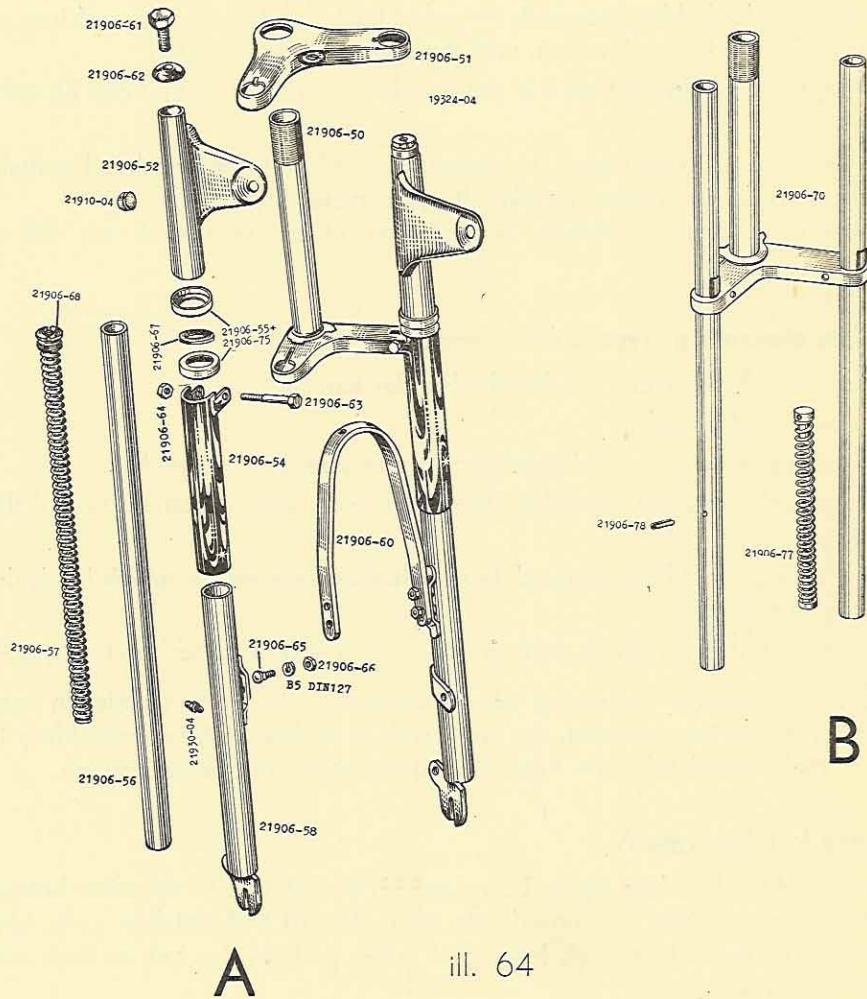
**Bosch**

### 37. TELESCOPIC FRONTFORK

#### Maintenance.

The fork has been greased freely when being assembled, which insures a smooth operation. This grease is sufficient for several years, thus making it unnecessary to renew it for some time.

The spring tension is progressive, offering the maximum riding comfort. It is however necessary to lubricate the sliding bushes with grease, which should be done at least every 1000 km (600 miles). A grease nipple is fitted to every fork leg for this purpose.



#### Complete dismantling. Type A (old model).

As shown in ill. 64, there are 2 types of forks. Type B is the later model, which differs from type A only in a few ways.

On the following pages and operations, the difference is always indicated.



If required, disconnect the brake cable, the easiest way is to remove the cam arm from the anchor plate.

Remove subsequently:

1. Front wheel.
2. Bolt 21906-61 and washer -62.
3. Clamping bolt -63.
4. Complete fork leg, with spring tube -56 and spring -57.

**NOTE.** If only one fork leg has to be removed, disconnect the concerned side of stabiliser and mudguard only.

5. Spring -57, by holding internally-threaded bush lightly in a vise, and turning leg in anti-clockwise direction, until the spring is disconnected.
6. Spring tube, by also turning it in anti-clockwise direction until it can be withdrawn.

In case of further dismantling, it is necessary to undo the steering head partially or totally, in order to displace or take off upper plate -51.

The latter is necessary to remove lamp carrier, chromium plated ring -55, or fork tube.

#### **Complete dismantling. Type B (new model).**

1. Disconnect brake cable, as discribed onder type A.
2. Remove front wheel.
3. Disconnect mudguard and stabiliser on one side only, if needed.
4. Unscrew the required fork leg (anti-clockwise), until it comes free of the spring.
5. If the spring should be removed, tap out hollow locating pin which holds the spring in position.
6. Dismantling the remaining parts is done in the way discribed under type A.

**NOTE.** With type B, the spring tube is welded to the bottom plate. In case it has to be replaced, cut weld with a hacksaw. When rewelding it, make absolutely sure tube is fixed in exactly the same position.

#### **Replacing fork leg. Type A.**

If only one of the fork legs has to be replaced (for inst. due to defective bronze bushes), disconnect the concerned side of mudguard and stabiliser only. Unscrew fork leg (anti-clockwise), leaving all other parts of the fork in their respective positions.

Re-assemble in reversed order.

#### **Replacing fork leg. Type B.**

In this case disconnect only the mudguard and stabiliser on the side concerned. Continue as discribed under type A, para's 1, 2 and 4. The remaining parts can be left untouched.

**IMPORTANT:**

In case the bronze bushes need replacing, we advise you to make use of our exchange service. On return of a fork leg, a reconditioned part is delivered in part exchange. Prices on application.

**Fitting.**

This may be carried out in reversed order of dismantling, paying particular attention to the following:

1. Spring should be screwed in as far as possible.
2. In the upper plate, there is in the hole for the spring tube, a stamped marker, which should go into the corresponding slot of the tube.
3. Check whether upper plate is absolutely horizontal with regard to the bottom plate. Measure distance between upper- and bottom plate at 3 or more places.

When tightening steering head nut, it will not rest evenly on the upper plate if the latter does not lie flat.

**Type A:** If plate is not flat, undo clamping bolt -63 and tap fork leg in position with a **rubber** hammer.

4. Now fit front wheel. Take care, that **no tension is noticeable in the fork legs**, when tightening the wheel nuts. If there is, add or take away some washers.

**NOTE.** In case no speedo drive is present, pay attention to the distance bush on the spindle, between hub and R.H. fork leg when fitting the wheel. If there is a speedo drive, the distance bush should be removed. Distance bush should be left in its place, if a LUCIA speedo drive is used.



### 38. BECKSON COASTER HUB

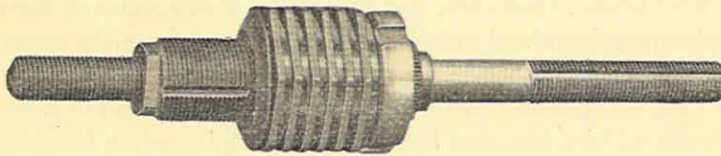
All autocycles, previous up to engine number 11979 have been equipped with hub type Pa, having a spindle diameter of  $\frac{3}{8}$  inch.

From this engine number, a hub type Pa-A is fitted, having a spindle diameter of  $\frac{7}{16}$  inch.

On the following pages, the operations concern type Pa, unless otherwise stated. Although the hub seldom needs dismantling, a summary of the re-assembling is given below, as thorough knowledge thereof is necessary when carrying out repairs.

#### FITTING.

- A
1. Over the square part of the spindle, the thrust ring (24) is placed with the bevelled edge facing the collar of the spindle.
  2. Against the thrust ring, place alternatively a brass ring (23), a steel ring (22), and so on. In total there are 8 rings of each. **Pa-A hub has 10 of each.**
  3. After the last steel ring follows the spring retainer (18) and the brake cone (5). The latter with its largest diameter against the former. Now the square part of the spindle is completely filled (ill. 65).



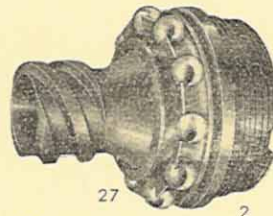
ill. 65

- B
1. Place a ball race (27) over the outer race of the driving head (2).

#### IMPORTANT.

The trade mark on the cage must face the collar of the driving head: therefore invisible when fitted (ill. 66).

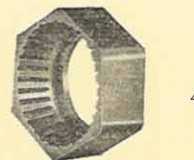
2. Now fit hexagon driving cone (4) over the coarse thread of the driving head, the smaller opening facing the ball race (ill. 67).



ill. 66

- C
1. Plate dust ring 21704-32 over over centring collar of driving head.
  2. Fit sprocket (21) on driving head. **Do not clamp coarse thread in the jaws of a vise**, but use the **special retaining tool**, which can be ordered from the manufacturers.

Tighten sprocket firmly with the aid of a chain spanner (indentical to ill. 4).



ill. 67

**IMPORTANT.** Fit sprocket with its collar facing the driving head.

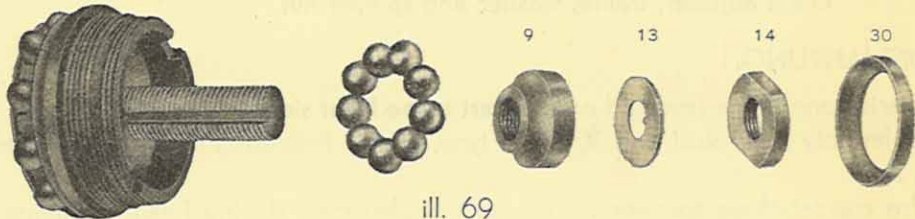
3. The locknut for the sprocket (11) with **left-hand** thread should now be screwed onto the driving head and tightened firmly. Steady driving head during this operation by using chain spanner on sprocket.
- D
1. Behind the assembly, dealt with in para A, first fit on the spindle the complete clutch cone (6), including friction spring and spring shoes as shown in ill. 68 and thereafter the driving assembly, dealt with in para B.

**NOTE.** The three protruding legs of the friction spring (ill. 68) must be able to move **freely** in the corresponding grooves of the spring retainer. See also under heading Repairs, para D.



ill. 68

- E
1. Apply a fair amount of grease to inner race of driving head and press 9 balls of  $\frac{1}{4}$  inch into it. **The Pa-A hub needs 10 balls.**
  2. Fit dust cover 30. **Pa-A type cover number 80 (helical)** and screw in spindle cone (9). This cover should only go max.  $\frac{5}{32}$  inch into the hub, as otherwise it will foul the balls.
  3. Now adjust free travel (**very important**), as discribed under heading Adjustment.
  4. Fit subsequently the lock washer (13) and the spindle cone lock nut (14) as shown in ill. 69. **For type Pa-A, these numbers are 63 and 64.**

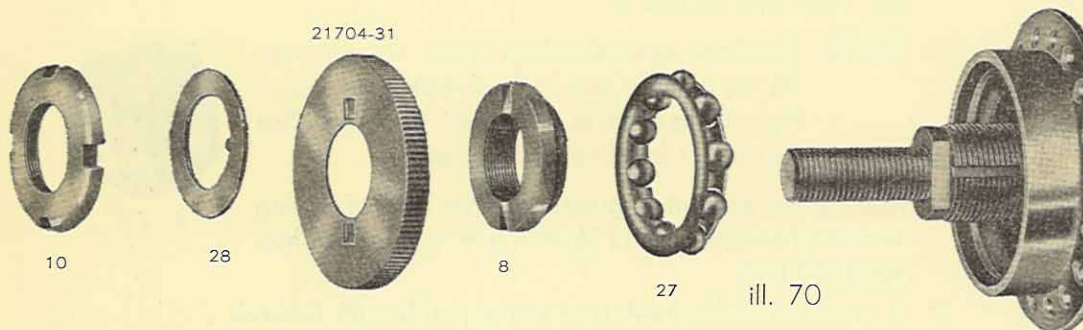


ill. 69

- F
1. Fit engine sprocket to the hub shell (right hand thread). Tighten firmly with chain spanner (ill. 4).
  2. Now fit lock nut 21704-12.
  3. Fit extra dust ring 53 into the hub shell, on the side of the drive sprocket.
- G
1. The whole internal assembly should at this stage be lubricated, by submerging it in a tin with hypoid oil EP 90, such as Shell Spirax EP 90. Leave it some time, to get rid of superfluous oil.
  2. Bring the flat sides of the friction rings into alignment on a clean, flat surface.
  3. Feed the complete assembly into the hub shell from the side of the engine sprocket.
- H
- Fit subsequently on the lever side:
1. Ball race 27 with **trade mark** on the **outside**.



2. Extra dust ring 54 into the hub shell.
3. Lever cone 8.
4. Knurled dust ring 21704-31. Its 2 knobs should go into the corresponding grooves of the lever cone, enabling it to be adjusted by means of turning the knurled dust ring.
5. Lock washer lever side 28 and its lock nut 10, as shown in ill. 70.



6. Reaction lever with the trade mark on the outside. This lever should go on the spindle with a fairly tight fit. In any case there must not be any play. If necessary, fit it with the aid of a washer and a nut.

**When dismantling, remove lever by unscrewing lever cone lock nut: NEVER USE A HAMMER. When hitting it, the force is taken up by the ball race, which in most cases will become useless.**

**No lock nut goes against the lever, as it will be kept in its place by the chain adjuster, frame, washer and spindle nut.**

#### DISMANTLING.

This is done in the reversed order: **Start at the lever side.**

Preferrably leave dust ring 30 (Pa-A type, nr. 80: helical) in its place (compare E 2).

Use special chain spanner to remove sprocket from driving head. (If hammer and center punch are used, driving head will be damaged).

#### ADJUSTMENT OF FREE TRAVEL AND BEARINGS.

**Free travel** is the distance over which the sprocket on the driving head can move, between pedalling and braking. The maximum free travel is 60°; free travel is present, if the wheel runs freely and no braking power is applied.

#### IMPORTANT:

**Free travel** is adjusted by means of the **spindle cone 9** (R.H. side) Pa-A nr. 59.

**Bearings** are adjusted by means of the **lever cone 8** (L.H. side).

Proceed as follows:

- a. **When assembling:** In stage E (page 47), run down spindle cone 9 until there is 1,5 mm ( $\frac{1}{16}$  in.) play between the friction ring assembly. Check this by inserting an extra steel ring on both sides of the spindle, in between the assembly, and tighten spindle cone by hand.

Instead of using 2 friction rings, a fork of equal thickness can easily be made. After taking out the 2 "distance rings", the required free travel is obtained.

- b. **Adjust bearings** by turning lever cone with the aid of knurled dust ring in stage H (page 47 and 48).
- c. **Adjusting bearings when hub is fitted in frame** is carried out as follows:
  1. Undo lever cone lock nut 10.
  2. Adjust lever cone by turning knurled dust ring.
  3. Tighten lever cone lock nut again.

**NOTE.** Hence it is obvious that the hub can remain in the frame. Even the spindle nuts can be left tight and the spindle cone must not be touched.

- d. In case the free travel has to be adjusted later on, then:
  1. Take wheel from frame.
  2. Loosen lever cone lock nut.
  3. Screw out lever cone slightly.
  4. Loosen spindle cone lock nut.
  5. Adjust spindle cone.
  6. Tighten again spindle cone lock nut.
  7. Adjust bearings by turning knurled ring.
  8. Tighten lever cone lock nut.

**N.B.** Free travel is made **larger** by screwing **out** the spindle cone, and **smaller** by screwing it **in**.

### LUBRICATION.

The Beckson hub should be lubricated with HYPOID OIL EP 90 (for inst. Shell Spirax EP 90). Lubricate lavishly, using a pressure oilcan with an extension made from a plastic piece of tubing, which goes over the nipple in the hub.

Apply oil every 500 to 1000 km (350 to 650 miles).

The ball races should be greased with waterproof bearing grease (for inst. Shell Retinax A).

Apply new grease every year preferably.

### REPAIRS.

Below is given a summary of faults which may turn up in practice. Using this, any fault is detected quite easily. Repairs however can only be carried out successfully, when the fitting instructions are strictly adhered to.

The letters in the column "Cause" mean:

- a. Normal wear, or other defect due to lasting use.
- b. Fault caused by rough treatment or total lack of care.
- c. Fault caused by incorrect fitting or dismantling on previous repairs.



- d. Fault caused by overheating of the hub, due to drag on the brake, when riding, or to excessive use in mountainous country.
- e. Lack of lubrication or the use of wrong oil.

#### A Substantial damage.

Practically always caused by b or c. Most frequently:

1. Incorrect order or amount of friction rings.
2. Too much or too little free travel.
3. One of the ball races fitted the wrong way round (compare Fitting, Para B 1).
4. Brake cone omitted.
5. Bent or broken friction spring (25) or spring shoes (33), due to rough treatment.
6. Insufficient or incorrect lubrication.
7. No, too late, or faulty adjustment of wheel bearings.
8. Lever cone lock nut not tight. The cone will undo itself and the hub will be destroyed due to excessive play in all the moving parts.
9. With autcycles, it often occurs that the rider lets the brake drag, causing the hub to run hot — run dry — resulting in premature wear. Dragging is facilitated by too little free travel.

#### B Hub drags.

	Cause	Remedy
1. No, or insufficient lubrication.	e	Use discribed lubricant.
2. Totally gummed or polluted lubricant.	a, d	Dismantle, clean carefully and rebuilt hub according to instructions.
3. Extremely low temperatures.	—	Use the prescribed Hypoid EP 90 lubricant, which stays sufficiently fluid at low temperatures.

#### C Hub slips when pedalling.

- |  |   |  |
|--|---|--|
| 1. Conus in hexagon ring worn so much, that clutch cone engages too deeply, and face of ring fouls the spring shoes. | a | Take a little bit off the face of hexagon ring with file or lathe. This can be done, as ring is not case-hardened, but tempered. |
| 2. Friction spring too weak.   | a | Replace.   |

	Cause	Remedy
3: Too much free travel.	c	Due to this, the prongs of the friction spring may be pulled out of the grooves in the spring retainer. Adjust free travel.

**D Insufficient braking effect or slipping backwards.**

1. Knurled surface of brake cone worn: must be sharp.	a	Replace
2. Too much free travel.	c	See para C 3.
3. Oil too thick.	e	Use prescribed lubricant.
4. Brake cone goes too far into clutch cone, causing spring shoes to foul spring retainer.	a	Best is to replace clutch cone and brake cone.

**E Hub makes abnormal noises.**

When riding, hub produces a "crackling" noise and there is play in the bearings, although lever cone is tight.

— Cups in hub shell loose. Remove old cups and replace. Leave hub in wheel.

**F Hub brakes brusquely and/or squeals.**

1. Insufficient lubrication.	b, e	Apply lubricant lavishly.
2. Used oil too thin.	a	Lubricate as prescribed.
3. Burning of the friction rings (reddish colour).	a, d	Best is to replace rings, although coloured layer can be removed with emery cloth.

**G Hub leaks oil.**

1. Used oil too thin.	e	Lubricate as prescribed.
2. Too much oil added at once: Oil often, but not too much.	e	Lubricate as prescribed.

**NOTE.**

In case spring shoes or friction spring are broken or worn out, these parts should be replaced by new ones. This is best done at our works. A complete unit should be sent for part exchange, in which case a rebuilt unit is returned. Costs involved are only those for the new parts.



**SPARE PARTS.**

The following parts are **NOT INTERCHANGEABLE:**

	Pa	Pa-A
Driving head	13705-02	21704-52
Clutch cone	13705-06	21704-56
Spindle	21704-14	21704-57
Spindle cone	13705-09	21704-59
Spindle cone lock washer	13705-13	21704-63
Spindle cone lock nut	13705-14	21704-64
Spindle cone dust ring	13705-30	21704-80
Reaction lever	21704-13	21704-84
Wheel nut	12907-04	21927-04
Washer	121044-04	211044-04

**GUARANTEE.**

Hub, and parts thereof, will be replaced by us free of charge, if the cause of their defect is due to faulty material or initial assembly at the factory.

It may be clear, that the above does not apply to defects, caused by inexperience or carelessness by the user.



**39. ENGINE FAULTS.**

The page numbers mentioned hereafter refer to the appropriate operations of carrying out the tasks in question.

**1. ENGINE WILL NOT START.**

Possible causes:

- a. No fuel in tank.
- b. Petrol tap closed.
- c. Blocked jet (see page 33, op. 5).
- d. Clutch slips.

To remedy: Re-adjust clutch cable and adjuster screw (see page 29, op. 34). If this has no result, dismantle clutch and trace the cause (page 15, op. 8.).

- e. Choke functions poorly, or not at all.

To remedy: After taking carburettor off intake pipe, check correct adjustment of throttle valve or if it does not jam (page 33, op. 6).

- f. Spark plug fouled, electrodes gap too wide or too narrow, deposit on electrodes.

To remedy: Take out spark plug and clean it (take it apart or burn it clean over a welding flame). Re-adjust electrodes and test.

- g. Magneto does not spark, bad connections, fractured plug lead, defective condenser or ignition coil.

To remedy: Take out plug, turn flywheel quickly, and check spark at end of plug lead. If necessary, take off flywheel (page 13, op. 7), inspect connections and test coil and condenser separately and replace if the case may be (see page 42).

- h. Breaker points burnt or corroded, gap too large or too narrow, hammer jams.

To remedy: File point surfaces and set gap at prescribed distance. Test hammer for easy operation, polish spindle if necessary (page 39, contd.).

- i. Oil residue or water in carburettor.

To remedy: Dismantle carburettor, clean it carefully and re-set if necessary (page 35, op. B).



## 2. ENGINE STARTS, BUT STOPS AGAIN IMMEDIATELY.

Possible causes:

**a. Choke opened too quickly.**

To remedy: Use choke again.  
Jet too small (very cold weather only).

**b. Insufficient fuel supply.**

To remedy: Take out jet holder and check if supply is adequate, when petrol tap is opened. If not, clean filter in banjo bolt and petrol tap.

**c. Faulty condensor.** Noticeable when a spark is visible at breaker points when engine is running.

To remedy: Take off flywheel and file points. If spark remains, replace condensor.

**d. Faulty spark plug.**

To remedy: See 1 f, on page 53. If this gives no result, replace plug.

## 3. ENGINE SUDDENLY CUTS OUT WHEN RUNNING.

Possible causes:

**a. "Whiskering" of spark plug electrodes.** This is the result of an airleak on intake side (airfilter, carburettor, intake pipe) permitting dirt to enter. Leaking gas and oil seal, cylinder base gasket, or joint between cylinder and its head.

To remedy: Apply check, discribed on page 9, chapter 1, contnd.

**b. Blocket jet due to dirty petrol.**

To remedy: See page 33, op. 5.  
If this happens frequently, and with short intervals, it is necessary to free tank, tap and carburettor from impurities. Rinse tank with clean, pure petrol.

**c. Corroded or faulty spark plug.**

To remedy: See 1 f, on page 53.

**d. Breaker gap too narrow.**

To remedy: See 1 h, on page 53.

**e. Faulty ignition coil.** This is generally the fault when engine starts fairly easily when cold, but will run indifferently or not at all, as the normal working temperature is reached.

To remedy: Take off flywheel and replace ignition coil (see page 13 and 55 f).

**f. Loose contact somewhere in the ignition system.**

This fault is recognisable by the irregularity of the engine when running.

To remedy: Remove flywheel and test all connections. See pages 13 and 42.

**g. Engine seizes.**

This may be caused by overheating, running it without oil, or some mechanical defect. In the latter case it sometimes happens that the crankshaft cannot be rotated at all. General dismantling is then necessary.

To remedy: Take off cylinder, check piston and remove seizure marks ~~with emery cloth~~. Fit new piston rings. If cylinder and piston are badly damaged, replace.

In persistent cases, in which the piston keeps on seizing, inspect whether connecting rod is not out of alignment or bent. This is to be seen from abnormal marks of wear on one side of piston only (see page 26, para 5). An airleak may also cause overheating.

**4. ENGINE LACKS POWER, NO CONSTANT PERFORMANCE, OR FAILS TO PICK UP REVS.**

Possible causes:

**a. Carbon deposit in exhaust port, exhaust or on piston crown.**

Excessive carbon deposit may cause the engine to run and start badly, due to bad scavenging as a result of partially obstructed ports.

Decarbonising after 2000 to 4000 km (1400 to 2800 miles) is unavoidable.

To remedy: Follow decarbonising instructions on page 11, op. 4 contnd.

**b. Induction of false air through inlet.**

To remedy: Tighten flange connection of intake pipe. If necessary, replace gasket. Check welded joint between flange and pipe for leakage. Inspect carburettor connection on intake pipe. Look for airleaks in cylinder, head and crankcase (flaws). See page 9, op. 1, contnd.

**c. Too much or too little fuel, wrong setting of carburettor.**

To remedy: Check flow of fuel (see 2 b). Loose jet or atomiser. Wrong jet size. Dirty air filter, worn or incorrectly fitted throttle valve (see page 34, contnd.).

**d. Faulty spark plug or ignition timing too late.**

To remedy: Replace plug and adjust electrodes. Re-set ignition timing (see page 40 and 41).



**e. Airleak in crankcase sections.**

A fault of this nature will be obvious from the fact, that when running without load, the engine achieves the required revs, but lacks power when running on load.

To remedy: See 4 b, and check for airleak. In most cases the gas and oil seal is at fault. Dismantle engine and replace seal (page 21, op. 15). True up faces of both crankcase halves with very fine emery cloth and fit new gaskets, which should previously have been soaked in pure linseed oil.

**f. Mechanical resistance due to internal defect.**

In the majority of cases this is accompanied by abnormal metallic sounds. The crankshaft may possibly run heavily.

To remedy: Dismantle engine and replace defective parts. If ball bearings have become defective, then the bearing fittings in the crankcase sections should also be checked.

**g. Rotating disc valve closes insufficiently.**

A bent disc valve or broken spring may cause a considerable declination of power.

To remedy: Check sealing of valve (see page 9, op. 3 and page 22, op. 17).

Replace valve in case of doubt and true up bearing surface in R.H. crankcase section with the aid of the abrasive disc (page 20 and 8, ill. 1).

**h. Poor compression.**

This is caused by wear or, as a result of over-heating, the piston rings may have lost their resilience, or have become jammed in their grooves.

To remedy: Replace piston rings (see page 12) and remove all carbon deposit from their grooves. Take care not to damage the sides of the grooves, when doing this.

**i. Leaky joint of cylinder head.**

To remedy: Remove head and true up surface with very fine emery cloth on a surface plate (see page 28, op. 30).

**j. Insufficient passage through exhaust pipe or silencer.**

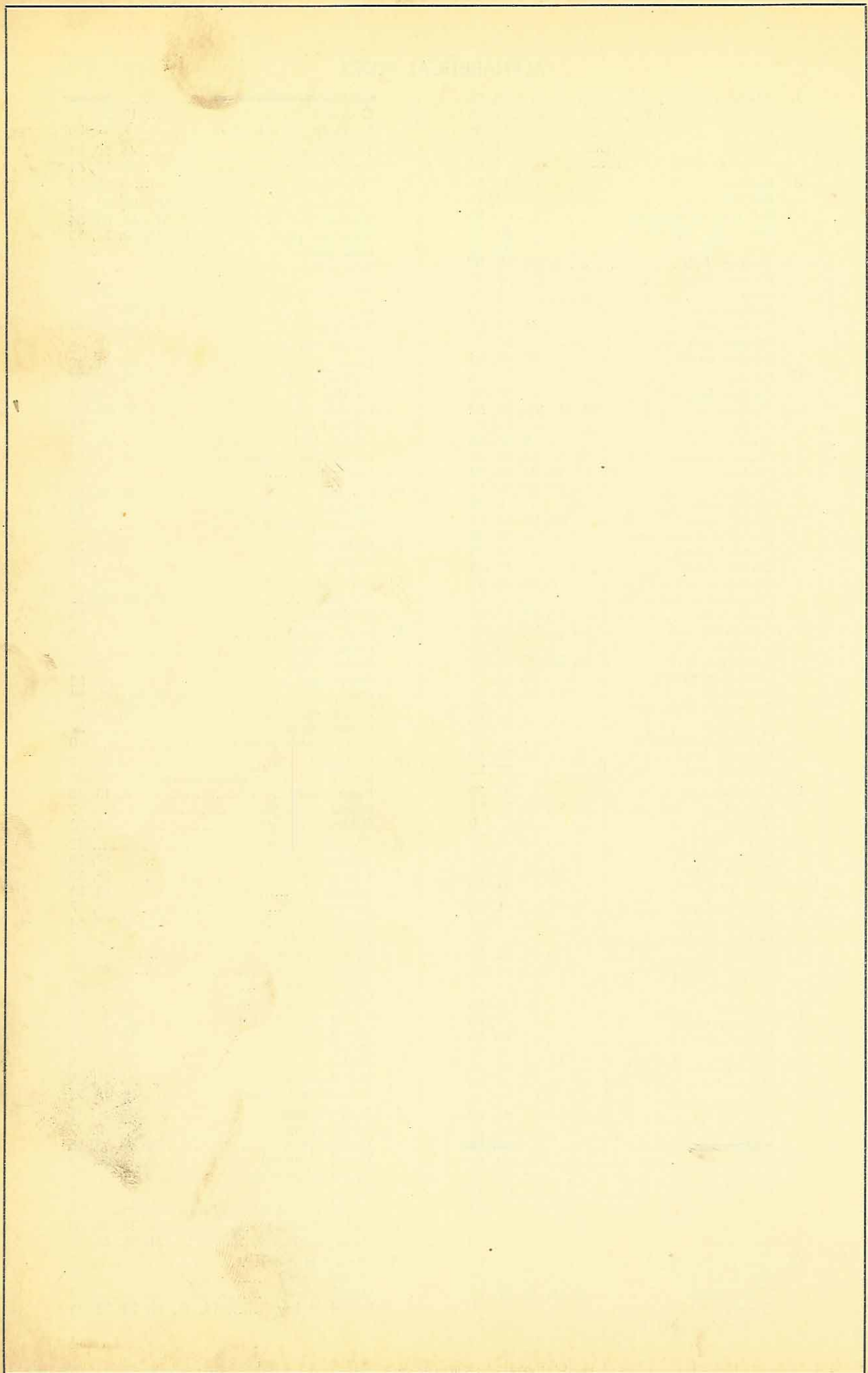
To remedy: Take off fish tail and clean holes in baffle. Exhaust is completely detachable.



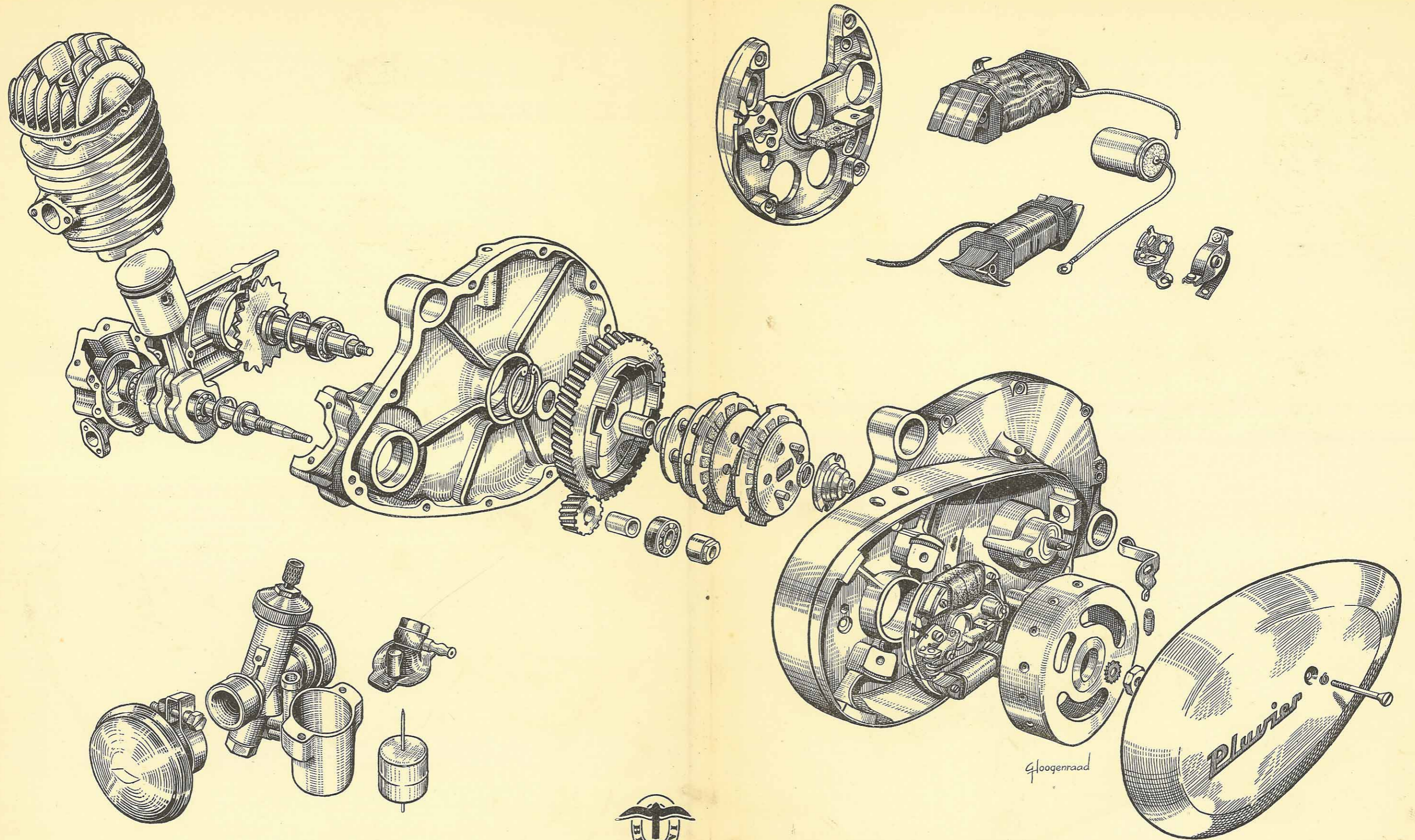
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