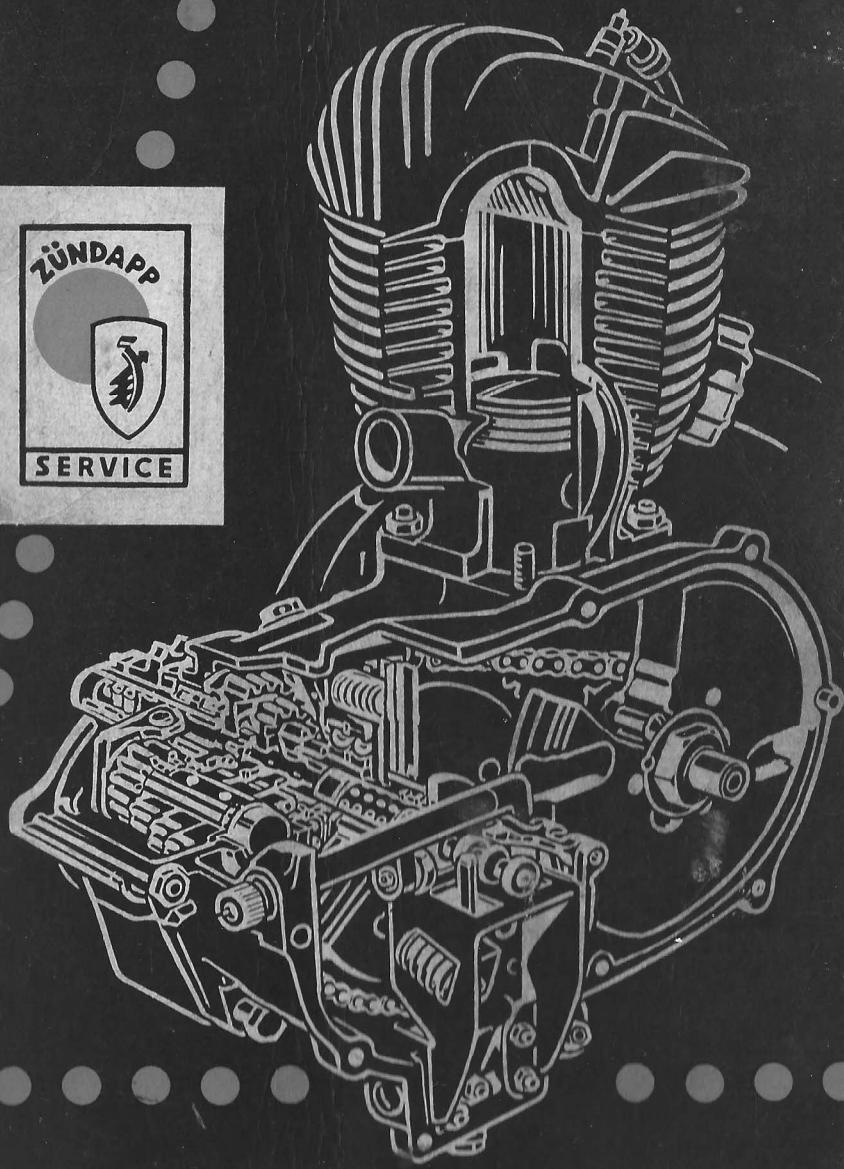
ZÜNDAPP

ZÜNDAPP SERVICE



Repair-Work on the twostroke-engine

REPAIRING TWO-STROKE ENGINES

of Models

DB 202, COMFORT, NORMA,

NORMA-LUXUS, ELASTIC 200,

ELASTIC 250, 175 S, 200 S, 201 S, 250 S,

BELLA R 150, R 151, R 153, R 154,

BELLA R 200, R 201, R 203

Published in October 1957

Foreword

The great popularity ZÜNDAPP two-stroke engines are enjoying all over the world chiefly originates from its traditional design which is the result of years and years of experience gained in designing and building motor cycles of world renown.

The so-called Derby Engine was sold more than 150,000 times before this latest series-built motor cycle with hand operated gearshift control had to give way to the highly developed DB 202 Engine with 4-speed gear unit and foot-change control. Especially the latter model — which, to-day, still features the same crankdrive arrangement, clutch assembly, and transmission design, — incorporates certain important advantages which have contributed essentially towards the proverbial ruggedness and dependability for which ZÜNDAPP products are famous.

Last, not least, the popularity of our motor cycles may be accredited to the untiring energy and devotion displayed by our extensive and highly qualified dealer organization closely connected with our house during many years. We are publishing this present booklet with the wish to acquaint also our younger dealers and agents with the technical knowledge indispensable for expert ZÜNDAPP service.

ZÜNDAPP-WERKE G.M.B.H. NÜRNBERG - MÜNCHEN

WERK NÜRNBERG

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E) Appendix

A) Range of Engine Numbers

On Motor cycle engines the engine number is stamped in at the cylinder flange and at the engine front side below the cylinder flange. On scooter engines the number is located at the cylinder flange and at the right-hand engine side near the clutch housing cover, approx. above the contact for the idle warning light.

The engine number always corresponds with the chassis number, whereby the latter number, on motor cycles, is stamped in at the steering head beside the rating plate, and on scooters at the rear right-hand frame bend, approx. beside the cylinder head.

Any other marks or numbers stamped into the engine are of no importance.

Below the number ranges for the various engine types are specified:

Model	Number Range	Year of Construction
DB 202	800001 — 816750	1951 — 1952
Comfort	820001 — 845000	1952 — 1954
Norma	860001 — 874728	1952 — 1953
Norma-Luxus	845001 — 904058	1953 — 1955
Elastic 200	875001 — 883000	1953 — 1955
Elastic 250	925001 — 930000	1954 — 1955
175 S	905001 —	1956 —
200 S	885001 — 836000	1954 — 1956
201 S	996001 —	1956 —
250 S	931001 —	1956 —
Bella R 150	1001 — 19290	1953 — 1955
Bella R 151	R 20001 — R 22499	1955 —
Bella R 153	R 23001 — R 29100	1956 —
Bella R 154	R 29101 —	1956 —
Bella R 200	50001 — 76900	1954 — 1955
Bella R 201	R 80001—R 107000	1955 — 1956
Bella R 203	R 107001—	1956 —

B) Technical Data

Motorcycles

	DB 202	Comfort	Norma and Norma-Luxus	Elastic 200	Elastic 250	175 S	200 S	201 S	250 S
Capacity (c. c.)	198	198	198	198	246	174	197	197	245
Stroke/Bore (mm)	70/60	70/60	70/60	70/60	70/67	62/60	62/64	62/64	70/67
Compression Chamber (c.c.)	39 ± 1	39 ± 1	39 ± 1	36±1	43±1	32±1	36.5±1	36.5±1	35±1
Compression Ratio	1: 6.2	1 : 6.2	1 : 6.1	1 : 6.6	1 : 6.7	1 : 6.7	1 : 6.5	1 : 6.5	1 : 7
Engine Output at r.p.m. (HP)	7.5 at 4000	8.7 at 4250	8.3 at 4600	9.5 at 4700	13 at 5200	10.5 at 5400	12 at 5400	12 at 5400	14.5 at 5500
Piston Clearance (mm)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Electric System, Noris Type	MLZU 6/45	MLZU 6/45	MLZU 6/45/60	MLZU 6/45/60	MLZn 60/6/1600/2R	MLZn 60/6/1600/R	MLZn 60/6/1600/R	MLZn 60/6/1600/R	MLZn 60/6/1600/R
Advanced Timing mm before t.d.c.	2 — 3	3.5	3.5	3.5	4.0 — 4.5	3.5	3.5	3.5	3.5
Advanced Timing Degrees before t.d.c.	17.5 — 21.5	23	23	23	26.5	24.5	24.5	24.5	23
Heat Value of Sparkplug	225	225	225	225	225	240	240	240	240
Carburettor Type "Bing"	2/22/13	18/17/3 left (normal) right (additional) carburettor	18/17/3 left (normal) right (additional) carburettor	18/17/4 left (normal) right (additional) carburettor	2/26/34	2/24/46	2/24/42	2/24/46	2/24/46	2/26/51
Opening (mm)	22	18 / 17	18 / 17	18 / 17	26	24	24	24	24	26
Main Jet	95	90 / 70	90 / 70	90 / 70	125	110	120	110	110	120
Pilot Jet	40	35	35	35	40	45	45	45	45	40
Needle Jet	—	2,62 / 2,60	2.62 / 2.60	2.62 / 2.60	2.76	2.70	2.70	2.70	2.70	2.70
Needle Position from Top, Groove	1	3 / 1	3 / 1	3 / 2	3	2	2	2	2	3
Starter Jet	—	— / —	— / —	— / —	—	—	—	—	—	—
Air Adjusting Screw Turns Open	2½	1½ — 2	1½ — 2	1½ — 2	1½ — 2	1 — 1½	1½—2	1—1½	1 — 1½	1 — 1½
Mixing Chamber Insert	4	—	—	—	—	5	5	5	5	5
Gas Slide	—	—	—	—	—	—	—	—	—	—
Oil in Gearbox (c.c.)	650	650	650	650	650	650	650		650	650
Grade of Oil Below + 15° C. (60° F)	SAE 20	SAE 20	SAE 20	SAE 20	SAE 20	SAE 20	SAE 20		SAE 20	SAE 20
Grade of Oil Above + 15° C. (60° F)	SAE 50	SAE 50	SAE 50	SAE 50	SAE 50	SAE 50	SAE 50		SAE 50	SAE 50
Ratio of Mix	1: 25	1 : 25	1 : 25	1 : 25	1 : 25	1 : 25	1 : 25		1 : 25	1 : 25
Gear Ratios:										
1st speed	1 : 3.14	1 : 3.14	1 : 3.14	1 : 3.14	1 : 3.14	1 : 3.14	1 : 3.14		1 : 3.14	1 : 3.14
2nd speed	1 : 1.964	1 : 1.964	1 : 1.964	1 : 1.964	1 : 1.964	1 : 1.964	1 : 1.964		1 : 1.964	1 : 1.964
3rd speed	1 : 1.258	1 : 1.405	1 : 1.405	1 : 1.405	1 : 1.405	1 : 1.405	1 : 1.405		1 : 1.405	1 : 1.405
4th speed	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1	1 : 1		1 : 1	1 : 1

B) Technical Data

Motor Scooters

	Bella R 150 without starter	Bella R 151 with starter		Bella R 153 with starter	Bella R 154 with starter		Bella R 200 without starter	Bella R 201 with starter		Bella R 203 with starter		
Capacity (c. c.)	146	146		146	146		198	198		198		
Stroke/Bore (mm)	58/57	58/57		58/57	58/57		62/64	62/64		62/64		
Compression Chamber (c.c.)	26±1	26±1		26±1	26±1		37.5±1	37±1		37±1		
Compression Ratio	1 : 6.7	1 : 6.7		1 : 6.7	1 : 6.7		1 : 6.3	1 : 6.3		1 : 6.3		
Engine Output at r.p.m. (HP)	7.3 at 4700	7.3 at 4700		7.3 at 4700	7.3 at 4700		10 at 5200	10 at 5200		10 at 5200		
Piston Clearance (mm)	0.05	0.05		0.06	0.06		0.06	0.06		0.06		
Electric System, Noris Type	MLZn 60/6/1600/R	LA 12/100/3 L		LA 12/100/3 L	LA 12/100/3 L		MLZn 60/6/1600/R	LA 12/100/3 L		LA 12/100/3 L		
Advanced Timing mm before t.d.c.	3.0	3.0		3.0	3.0		3.0	3.0		3.0		
Advanced Timing Degrees before t.d.c.	23	23		23.5	23.5		23	23		22.5		
Heat Value of Sparkplug	225	225		225	225		225	225		225		
Carburettor Type "Bing"	2/20/15	1/20/15	1/20/19	1/20/19	1/20/19	1/20/38*)	2/24/40	1/22/79	1/22/89	1/22/89	1/22/96*)	1/22/110*)
Opening (mm)	20	20	20	20	20	20	24	22	22	22	22	22
Main Jet	90	110	110	110	110	105	110	110	105	105	100	110
Pilot Jet	40	45	45	45	45	45	35	40	45	45	45	35
Needle Jet	2.68	1508	1508	1508	1508	1508	1508	1508	1508	1508	1508	1608
Needle Position from Top, Groove	2	2	3	3	3	3	3	3	3	3	3	3
Starter Jet	—	70	80	80	80	80	—	70	85	85	85	85
Air Adjusting Screw Turns Open	1 — 1½	1½	1½	1½ — 2	1½ — 2	1½	1½	1½	1½	1½	1½	1½
Mixing Chamber Insert	3	—	—	—	—	—	—	—	—	—	—	—
Gas Slide	—	33	13	13	13	13	—	33	13	13	13	13
Oil in Gearbox (c.c.)	650	650		650	650		650	650		650		
Grade of Oil Below + 15° C. (60° F)	SAE 20	SAE 20		SAE 20	SAE 20		SAE 20	SAE 20		SAE 20		
Grade of Oil Above + 15° C. (60° F)	SAE 50	SAE 50		SAE 50	SAE 50		SAE 50	SAE 50		SAE 50		
Ratio of Mix	1 : 25	1 : 25		1 : 25	1 : 25		1 : 25	1 : 25		1 : 25		
Gear Ratios:												
1st speed	1 : 3.14	1 : 3.14		1 : 3.14	1 : 3.14		1 : 3.14	1 : 3.14		1 : 3.14		
2nd speed	1 : 1.964	1 : 1.964		1 : 1.964	1 : 1.964		1 : 1.964	1 : 1.964		1 : 1.964		
3rd speed	1 : 1.405	1 : 1.405		1 : 1.405	1 : 1.405		1 : 1.405	1 : 1.405		1 : 1.405		
4th speed	1 : 1	1 : 1		1 : 1	1 : 1		1 : 1	1 : 1		1 : 1		

*) only in combination with intake silencer in right-hand cover flap

C) Disassembling the Engine

Disassembling the complete engine will only be necessary in case of defects in the

Gearbox and Crankdrive.

For repairing defects in the

Gearshift mechanism (not the arrester for the Final Drive Shaft)
the Clutch, the
Flywheel, or the
Power Transmission from the Crankshaft to the Clutch

it will be sufficient to remove the Clutch Housing Cover.

Of course the

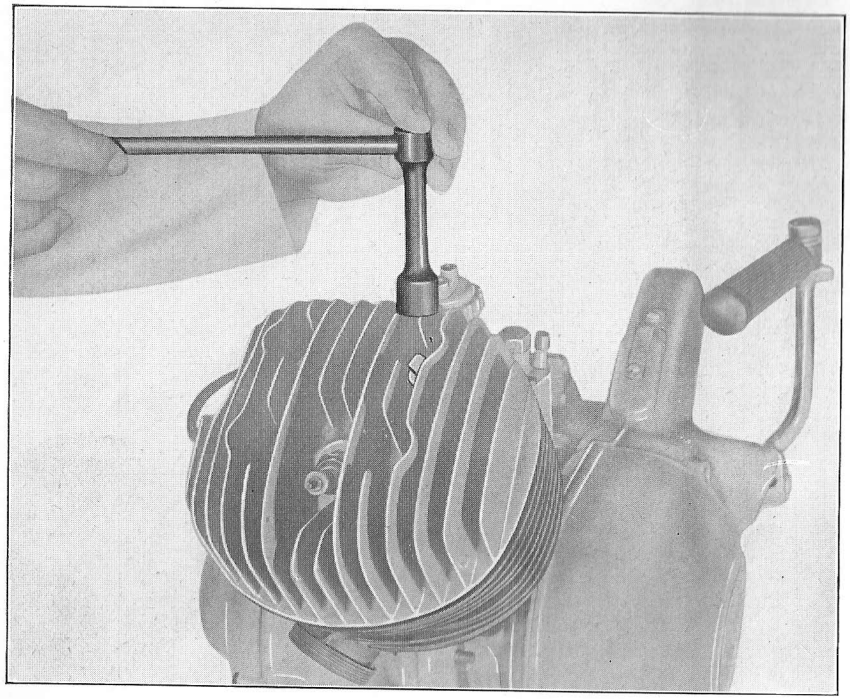
Kickstarter Lever and Return Spring,
Chain Sprocket, Clutch,
Generator with Armature,
Cylinder and Piston,

can be mounted and demounted without disassembling the engine.

The sequence of disassembling has been so selected as to guarantee a minimum of work hours.

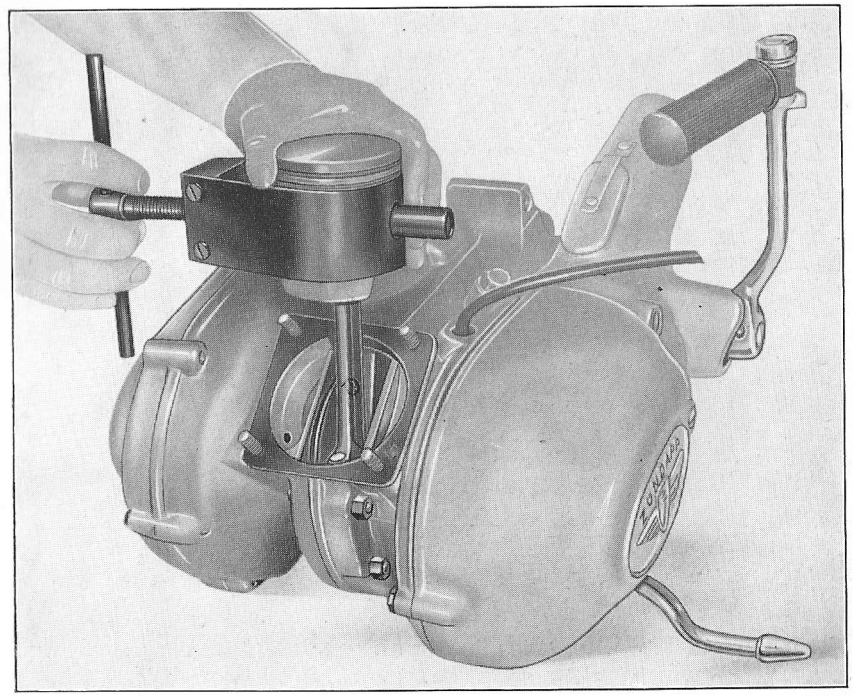
1. Removing the Cylinder, the Cylinder Cover, the Carburettor, and the Piston.

In urgent cases of trouble in the crankdrive or in the transmission the cylinder can be removed with cylinder cover and carburettor still screwed on. For this purpose it is necessary to just remove the 4 flange nuts M 8 by means of an engineer's wrench, or spanner, (SW 14). For correct servicing, the carburettor should be checked every time, and the cylinder cover freed from carbon deposits. For removing carbon deposits in the engine, or for checking the cylinder and the piston, it is necessary to remove the cylinder cover and carburettor together with the air cleaner.



The socket wrench No. 2021 z 51 (SW 12), in combination with a pin, is especially suited for removing the cylinder cover, no matter which type.

For detaching the carburettor with Norma, Norma-Luxus, and Comfort engines an engineers wrench, or spanner, (SW 9) is necessary. For all other models a medium-sized screwdriver will do. The piston can be removed effortlessly after the internal circlips have been taken out, and the gudgeon pin pushed through. With older models, the gudgeon pin has rather tight fit inside the piston, so that Tool No. 2501 k 12-0 = ZWN 212 should be used for forcing it out. With new models, the gudgeon pin can be pushed through with the thumb and a pin.

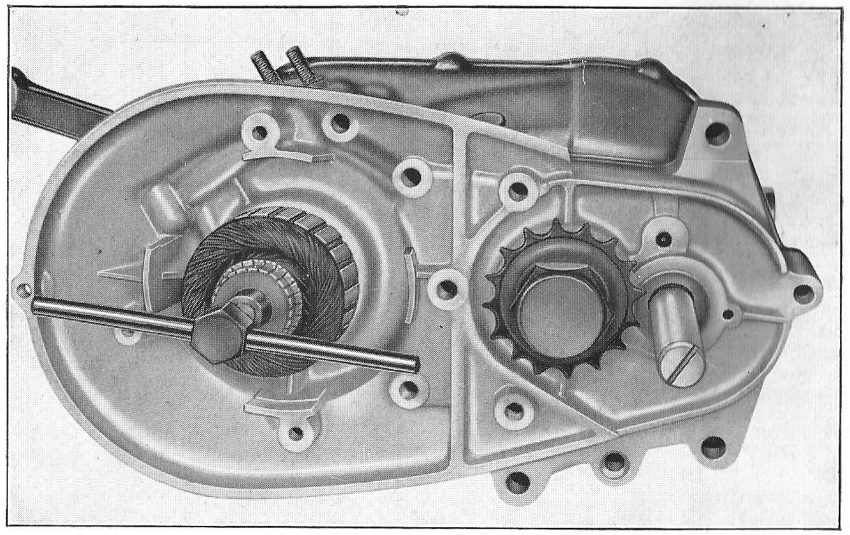


2. **Demounting the Generator**

The dust cover for models Norma, Norma-Luxus, Comfort, and scooters of older design is screwed down by means of 2 slot screws; scooters of recent design have 2 spring hoops. The generator cover for Elastic, 175 S, 200 S, 201 S, and 250 S can be removed by means of a spanner SW 10 and a sturdy screwdriver.

Before removing the generator housing, the 3 cables green — check light = No. 61, blue — ignition = No. 15, and red — current carrying cable = No. 30/51, are disconnected and taken out of the generator housing. For Elastic, 175 S, 200 S, 201 S, and 250 S the cables green, blue, and red are detached from the terminal strip, and, after the spark plug cover has been removed, pulled towards the inside together with the ignition cable.

The Generator housing is screwed down on the engine housing by means of 2 slot screws (3 for Elastic, 175 S, 200 S, 201 S, and 250 S). Use medium-sized screwdriver.



After the generator housing has been removed, press the carbon brushes outward until the leaf springs snap outward. This affords added protection for the carbon brushes during re-assembling.

After the armature set screw (SW 14) has been unscrewed, the armature can be forced out by means of the squeezing screw 2501 k 47-2 = ZWN 452 (for starter engines shorten screw by 15 mm).

3. **Removing the Kickstarter and the Protective Cover**

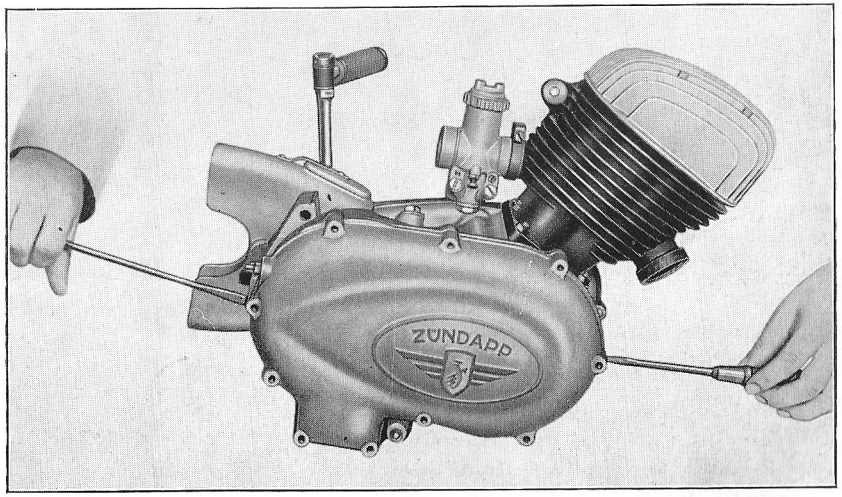
The starter is fastened to the starter shaft by means of a cotter pin. First unscrew hex nut by means of a hex wrench SW 10. With the screwed-on knock-out pin 2501 k 72-2 = ZWN 783 drive the cotter pin through, and remove it. Before, however, move starter in horizontal position. Now the kickstarter together with the return springs can be pulled off the starter shaft.

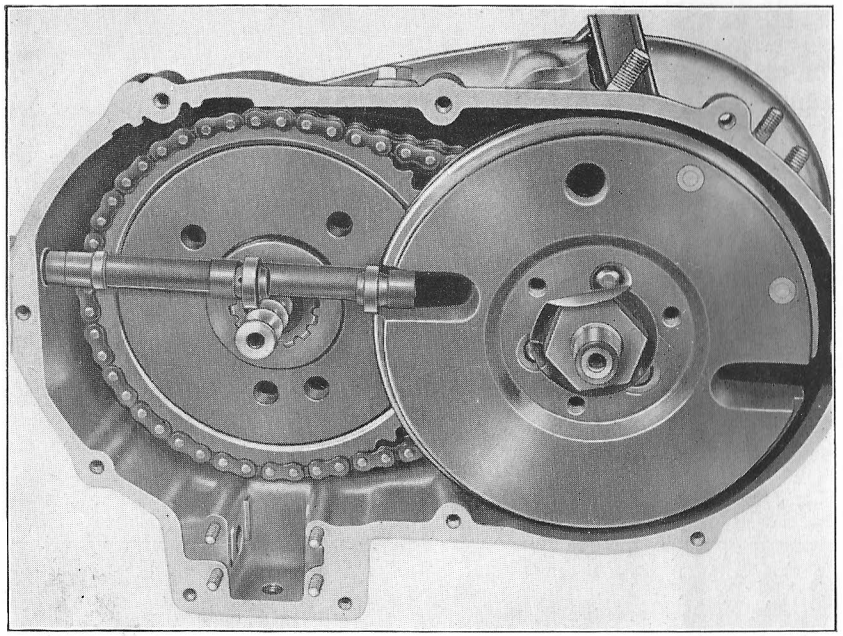
Finally remove protective cover.

4. **Clutch Housing**

Before disassembling the engine any further, remove the two drain plugs through which the oil in the gearbox is drained out. (Use wrench SW 14.)

Then remove the 10 set screws of the clutch housing cover by means of a socket wrench SW 10. Now the cover can be taken off without difficulty in the manner illustrated. Insert screwdrivers into recesses provided therefor in order to avoid damage to gaskets. The supporting bolt in the housing cover has been pressed in lightly, and can be removed without effort. For removing the ball bearing, heat the cover to approx. 185° F. (85° C.). By knocking the cover lightly against a soft base, preferably wood, the bearing will drop out.



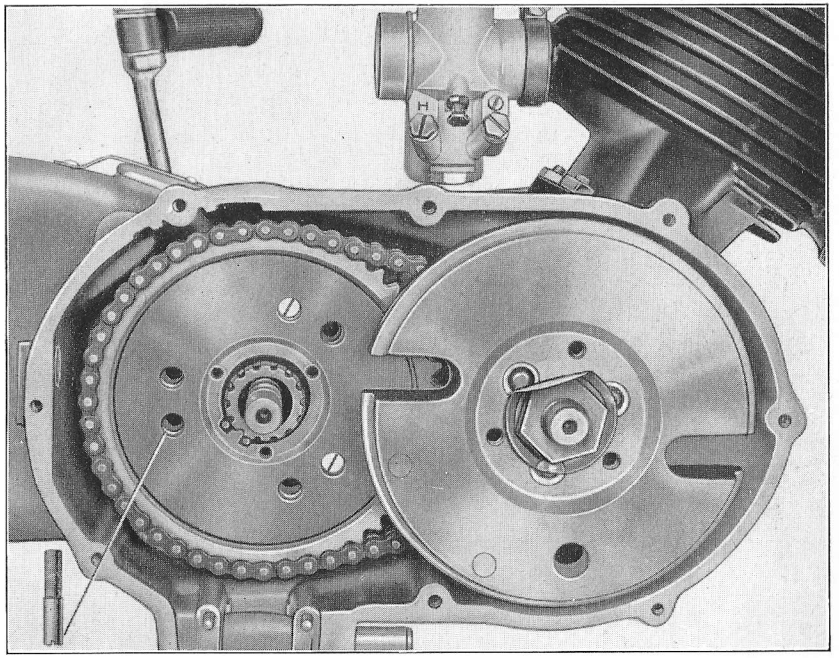


Next remove the gear selector support. The latter is screwed down to the housing by means of 4 nuts M 5 which can be unscrewed with a wrench SW 9. Watch out for shims 1281 z 242/243/244 located between gear selector support and clutch housing, and move selector shaft into first speed position.

After having removed the externally located clutch lever (wrench SW 10) and the rubber packing ring, the clutch pressure bar (disengaging shaft) can be taken out through the recesses provided for in the flywheel.

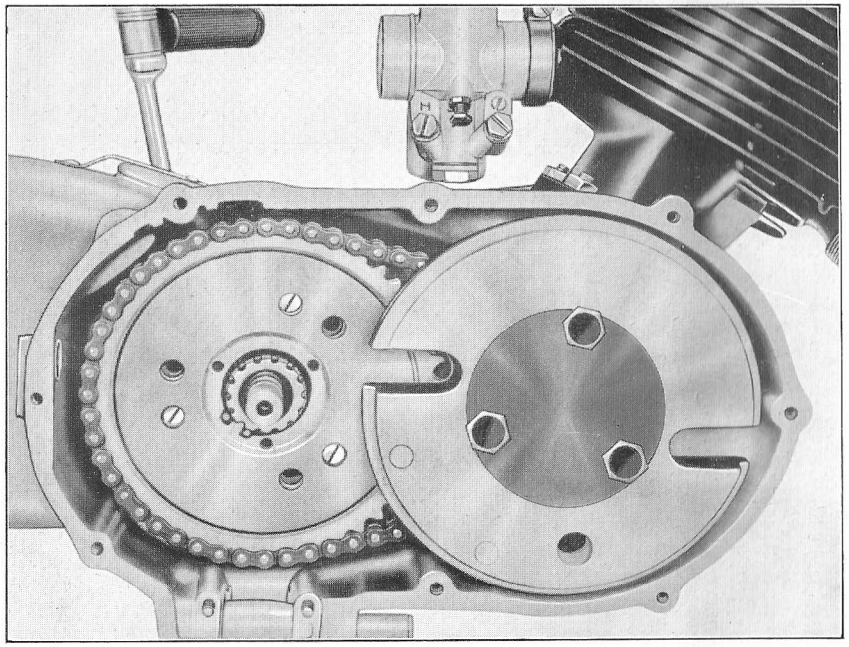
Now the knock-out pin 2501 k 72-2 = ZWN 783 is used to remove the cotter pin for the fastening of the foot change lever (resp. bell crank for scooter engines).

5. **Demounting Clutch Assembly and Flywheel**

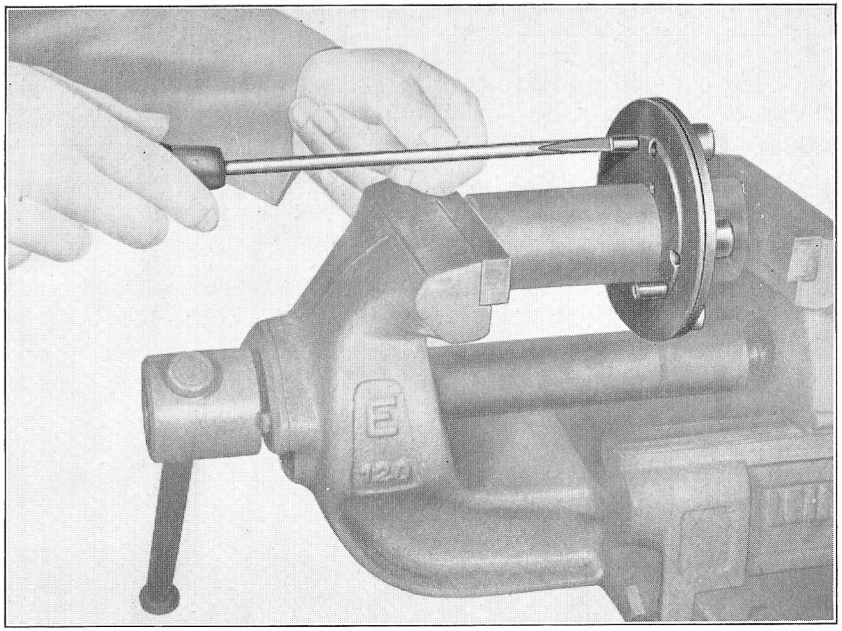


First remove the pressure ring and the 3 push rods located behind it. Insert 3 tension bolts 2501 k 71-2 = ZWN 782 through the holes provided in the clutch pressure plate and the steel discs located behind it, and tighten uniformly. This permits releasing the clutch and removing the circlip in front of the clutch pressure plate.

After unlocking and loosening the flywheel nut (Left-hand thread) by means of socket wrench 2501 k 66-2 = ZWN 777, the flywheel can



be pulled off by means of puller tool 2501 k 74-0 = ZWN 785, and taken off simultaneously with clutch pressure plate, clutch sprocket, and chain. By removing the internally geared ring and the second circlip on the clutch hub the other clutch parts can also be removed.



If the clutch is to be disassembled further it will be sufficient to remove the 3 tension bolts. In order to relieve the screws of all load, press the pressure plate against the spring carrier plate.

6. **Disassembling the Crankcase and Transmission Housing**

After having unscrewed the screwing between the two housing halves, the latter can be separated. A light knock with a rubber tipped hammer against the projecting shaft stub of the crankshaft will be sufficient to separate both halves.

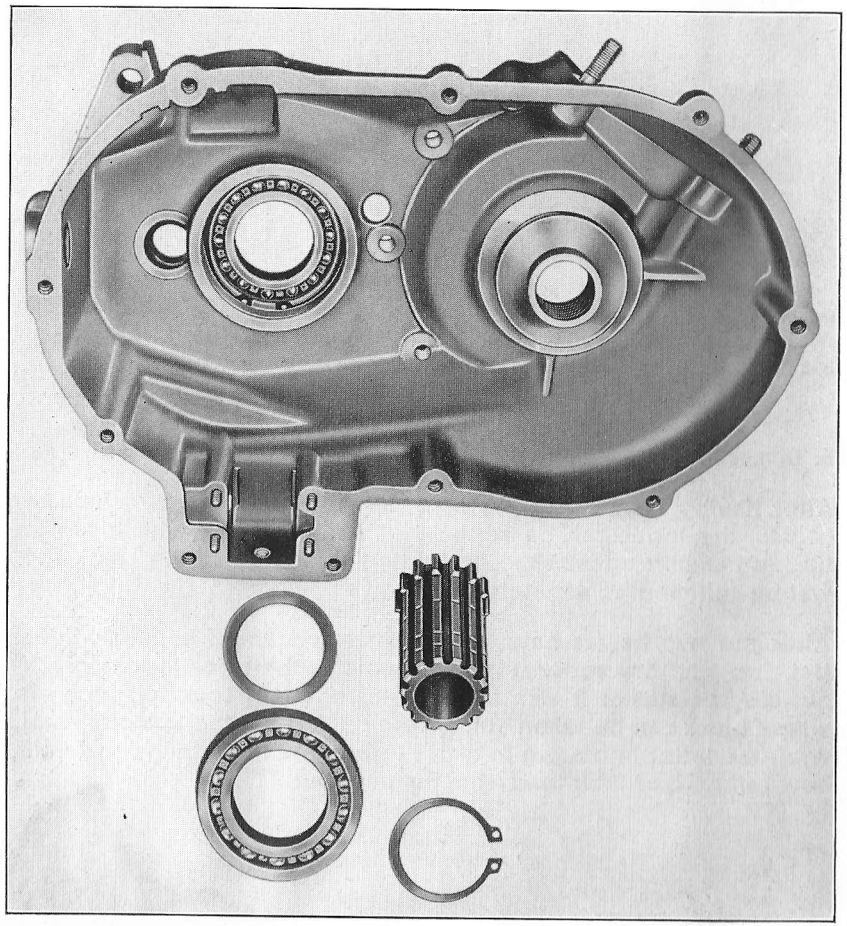
After the two halves have been separated, the 3 sliding wheels (1st, 2nd, and 3rd speeds) and the countershaft (for engines without electric starter it also acts as starter shaft) together with the wheel block can be taken out. Before pulling out the selector shaft, wrap the latter into a rag in order to prevent the springs and balls now relieved of their load from jumping out.

7. Right-Hand Housing Half (Clutch Side)

After having removed the circlip on the clutch hub (simultaneously 4th speed wheel) the latter can be taken out towards the inside (left). Both ball bearings 16007 DIN 625 for the clutch hub are removed as follows:

Heat housing part to 185° F, take out first ball bearing, then remove circlip and fitting washer 35 × 45 × 2 DIN 988, and, finally, take out second bearing.

The outer ball bearing ring M 25 DIN 615 for the crankshaft bearing can be removed by knocking the housing which has been heated to 185° F against a soft base (Preferably wood).



8. Left-Hand Housing Half (Generator Side)

The clamping nut for the drive sprocket can be loosened as soon as the safety washer has been unlocked.

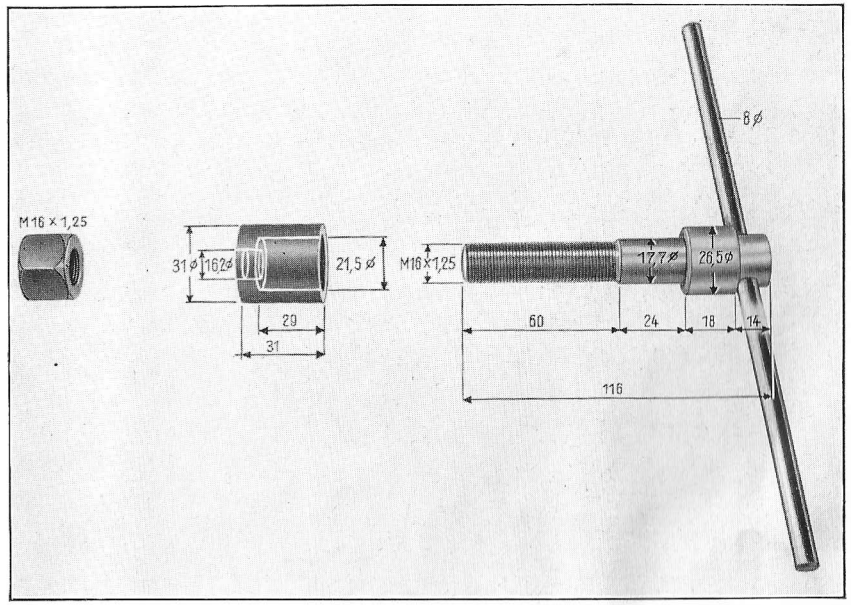
Now, it will be sufficient to remove the internal retaining ring in order to be able to take out the final drive shaft towards outside (for this purpose, heat housing part to 185° F).

8a. Left Hand Housing Half with Starter Engines

Here also the left hand crankshaft side is mounted in two bearings. The external ring of roller bearing NJL 20 is located between two circlips inside the housing. As soon as these two circlips have been removed, the ring can be demounted. Before, take off packing.

9. Disassembling the Connecting Rod

The two-part connecting rod can be disassembled with the help of a 7-mm Inbus wrench 2501 k 7-2 = ZWN 207a. The gudgeon pin bushing is pulled out with a suitable puller tool. We recommend that you manufacture the tool shown in our illustration. Stick the new bushing onto this tool so that it can be pressed in simultaneously.



10. **Disassembling the Final Drive Shaft**

Clamp the final drive shaft between the soft jaws of a vise. With two narrow screwdrivers remove the retaining ring, and push the shaft through towards the off side.

11. **Removing the Internal Rings for Crankshaft Bearings**

Two sturdy screwdrivers will be sufficient to force out the internal rings. In each case the washer located behind them will be destroyed.

11a. **Internal Rings for Crankshaft Bearings with Starter Engines**

On the generator side there are two internal rings, between them a distance bush. Remove by forcing out by means of two sturdy screwdrivers, or a commercial pulling tool.

12. **Demounting the Ball Race and the Bronze Bushing for Mounting the Selector Shaft inside the Clutch Hub**

The ball race can be removed as soon as the internal circlip has been taken out, afterwards the bush is forced out.

D) Re-Assembling

Before starting with the work it is absolutely necessary to clean all engine parts thoroughly with dry-cleaning gasoline. Packing surfaces of the housing must be cleaned of all packing material. A conventional three-square scraper will be sufficient. All parts which show any wear should be replaced. Treat packings and bearings with special care.

When mounting new parts make sure that they are the correct ones for the model in question (consult spare parts list). Only the transmission design is exactly alike for all types!

1. **Pre-Assembling the Crankshaft** (Fitting the Connecting Rod etc.)

Make sure the crankshaft fits the engine. All shafts look very much alike and cannot be distinguished with the naked eye. Solely the crankshaft for the starter engine can be distinguished by its special construction of the left-hand shaft side (2 bearing parts).

The crankshafts for DB 202
Comfort
Norma
Norma-Luxus
Elastic 200

are exactly alike. The distance from shaft center to crankpin center is 35 mm (half stroke).

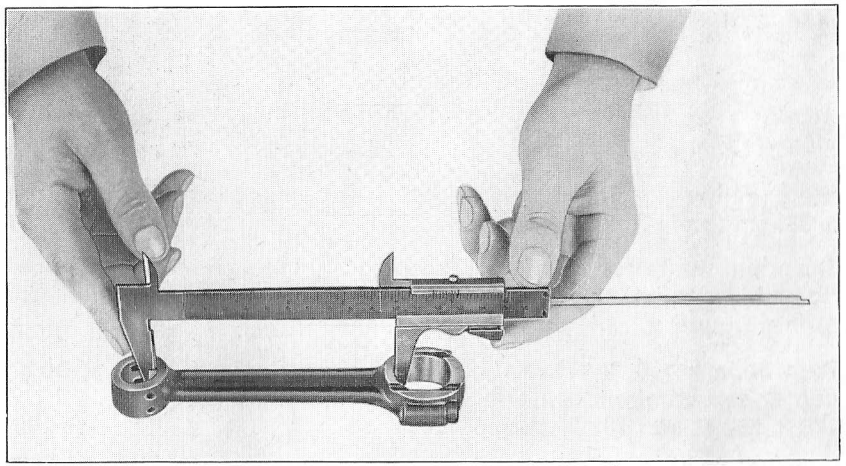
The crankshafts for Elastic 250 and 250 S distinguish themselves from this design only by its balance weights which are situated further outward.

With Bella R 150, R 151, R 153, R 154, the distance between shaft center and crankpin center is 29 mm; with Bella R 200, R 201, R 203, 175 S, 200 S, and 201 S, 31 mm.

Crankshafts are only delivered with mounted balance weights and connecting rods. (Balance weights must not be removed nor interchanged).

Also, before mounting the connecting rod make sure whether it is the correct one for the engine in question. Measure distance according to illustration. It is

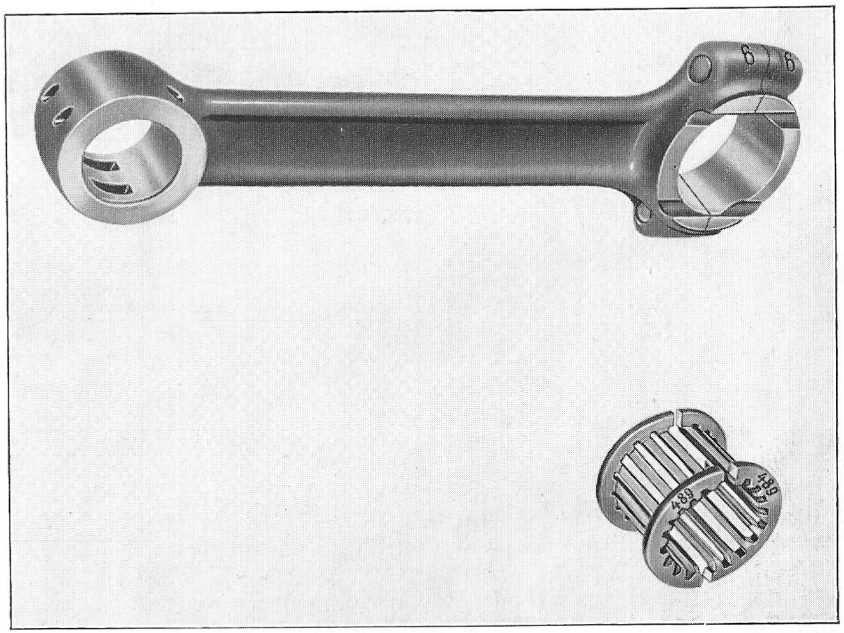
			Part No.
for	DB 202	117.6 mm	1160 k 01
	Comfort	117.6 mm	1160 k 01
	Norma	117.6 mm	1160 k 01
	Norma-Luxus	117.6 mm	1160 k 01
	Elastic 200	117.6 mm	1160 k 01
for	Bella R 150 / R 151 / R 153 / R 154	102.5 mm	1160 k 151
	Bella R 200 / R 201 / R 203	102.5 mm	1160 k 151
	175 S / 200 S / 201 S	102.5 mm	1160 k 151
for	Elastic 250	122.6 mm	1160 k 152
for	250 S	117.6 mm	1160 k 153



Important. Mount only such connecting rods with improved lubrication at the big end (4 lubrication holes).

For replacing the gudgeon pin bearing only use bushes of part No. 184 z 523, resp. No. 184 z 548 for 250 S, with added resistance against wear.

Cages and bearing needles for mounting the connecting rod on the crankpin are exactly alike with all models. Make sure that the distinguishing marks (numbers) correspond and are located opposite each other.



The ball bearing internal rings can be forced on by means of a manually operated press. Before, put on the two protective washers. The new and simpler design of washer can be interchanged against the conventional (beaded) type without difficulty (Old No. 1304 z 35, new No. 1281 z 382).

In order to force on the bearing rings, insert a steel rope between the crankshaft webs (a chisel etc. will also do) in order to prevent any damage to the shaft. With starter engines, the internal bearing ring of the roller bearing is forced onto the left-hand shaft side — after a distance bushing has previously been put in — in such a way that the ring has tight fit on the bushing. Together with connecting rod and forced-on internal rings the pre-assembled crankshaft is ready for mounting.

2. **Right-Hand Housing Half (Clutch Side)**

Heat housing to approx. 185° F and insert protective washer for the bearings of the clutch hub and the first ball bearing. Now the bearing is limited in its position by the internal circlip. Between bearing 1 and bearing 2 insert fitting washer 35 × 45 × 2 and internal circlip 62 × 2. Subsequently, mount 2nd bearing and — from the off side — the clutch hub. The bearing is locked in place by means of an external circlip on the hub. The ball race with 40 4-mm balls is now pushed into the hub, and locked in place by means of an internal circlip. It is recommended to fit the gear selector support at the same time. Watch out for the small packing gasket, i. e. proceed very carefully when inserting the shaft.

3. **Assembling the Clutch**

The different models have different facings and pressure springs adapted to the various engine capacities. It is of special importance to always use the correct parts for the engine in question. For some time now the clutch — by providing the sprocket with facings — has been having 3 — with model 250 S 4 — discs with facings, thereby permitting a reduction of spring pressure (easier handling of clutch control lever).

The Jurid discs used before can be interchanged against the more effective Cork — Buna discs (lighter colour and steel re-enforced). Mount discs 920 z 51 of 4 mm strength; discs 920 z 52 with 3.5 mm facing thickness are only used in the new design (with corked clutch sprocket). The following table shows the differences in the various designs:

Description	DB 202 Comfort Norma Norma-Luxus	Bella R 150/R 151 R 153/R 154	Bella R 200/R 201 R 203	Elastic 200	Elastic 250	175 S 200 S 201 S	250 S
Clutch Sprocket	2100 z 165	2100 z 165	2100 z 165	2100 z 165	2100 z 161	2100 z 165	2100 z 171
Clutch Spring	321 z 536	321 z 564	321 z 564	321 z 536	321 z 45	321 z 45	321 z 45
Primary Chain	A 9.5 x 9.5	A 9.5 x 9.5	A 9.5 x 9.5	A 9.5 x 9.5	B 9.5 x 4.5	A 9.5 x 9.5	A 9.5 x 9.5
	DIN 73 232	DIN 73 232	DIN 73 232	DIN 73 232	DIN 73 232	DIN 73 232	DIN 73 232
	62 links	62 links	64 links	62 links	64 links	62 links	62 links
Spring Carrier Plate	921 z 69	921 z 69	921 z 69	921 z 69	921 z 69	921 z 69	921 z 69
Spring Cup	781 z 273	781 z 273	781 z 273	781 z 273	781 z 273	781 z 273	781 z 273
Clutch Pressure Plate	921 z 67	921 z 67	921 z 67	921 z 67	921 z 67	921 z 67	921 z 67
Clutch Disc	921 z 68	921 z 68	921 z 68	921 z 68	921 z 68	921 z 68	921 z 206
Circlip	35 x 1.5	35 x 1.5	35 x 1.5	35 x 1.5	35 x 1.5	35 x 1.5	35 x 1.5
	DIN 471	DIN 471	DIN 471	DIN 471	DIN 471	DIN 471	DIN 471
Spacer Ring	1231 z 212	1231 z 212	1231 z 212	1231 z 212	1231 z 212	1231 z 212	1231 z 212
Clutch Plate	921 z 203	921 z 203	921 z 203	921 z 203	921 z 203	921 z 203	921 z 203
Push Rod	1691 z 113	1691 z 113	1691 z 113	1691 z 113	1691 z 113	1691 z 113	1691 z 113
Pressure Ring	1231 z 213	1231 z 213	1231 z 213	1231 z 213	1231 z 213	1231 z 213	1231 z 213
Clutch Disc (with facing)	920 z 51	920 z 51*)	920 z 52	920 z 51	920 z 52	920 z 52	920 z 53
		920 z 52					
Sprocket (on Flywheel)	2101 z 152	2101 z 152	2101 z 155	2101 z 152	2101 z 153	2101 z 152	2101 z 152

*) Bella R 150 former design

Wire gage of clutch springs: 321 z 45 = 2.25 mm ϕ, 321 z 536 = 2.1 mm ϕ, and 321 z 564 = 1.8 mm ϕ

Assembling:

The spring carrier plate is pushed onto the clutch hub mounted in the engine, and the 6 spring cups with the springs are inserted. Now the clutch pressure plate is pushed onto the hub in such a way that the 6 pervading holes correspond with the 6 threaded holes of the spring carrier plate. Compress the two discs and screw in the 3 set screws. Now the

disc with facing
steel disc
disc with facing
steel disc and
clutch sprocket

are put on. Make sure that the holes provided in the steel discs to receive the clutch push rods correspond with the three holes in the pressure plate. If, finally, the clutch sprocket with centering ring has been put on, the discs are locked in place by means of the set screw. Subsequently, take off the pre-assembled clutch from the clutch hub, and mount in engine together with primary chain and flywheel. (see chapter 7)

4. **Left-Hand Housing Half (Generator Side)**

Before mounting final drive shaft, crankshaft bearing external ring, and packing ring (with starter engines an additional external ring for roller bearing), measure gear unit adjustment. Proceed in the following sequence:

The right-hand housing half is laid down on its clutch side. Now insert starter shaft (countershaft) with the wheel block and the bearing bush located between them (see sketch), and put the 3rd, 2nd, and 1st speed gear wheel onto the clutch hub. Now join right-hand half and screw down by means of the center stud screw. The wheel block on the starter shaft must have approx. 0.2 mm of axial play. Spacer shims

1301 z 177	0.5 mm strength
1301 z 368	0.3 mm strength
1301 z 367	0.2 mm strength

are put on in such a way that the wheels of the block and the sliding wheels on the selector shaft cannot touch, i. e. there must be a certain amount of axial play between all of the wheels; normally

spacers are put on at the small wheel of the block, only in case of considerable differences it will be necessary to use spacers also on the other side, so that full gear mesh is guaranteed. Of great importance is that the lateral flanks of the wheel block and of the sliding wheels do not touch.

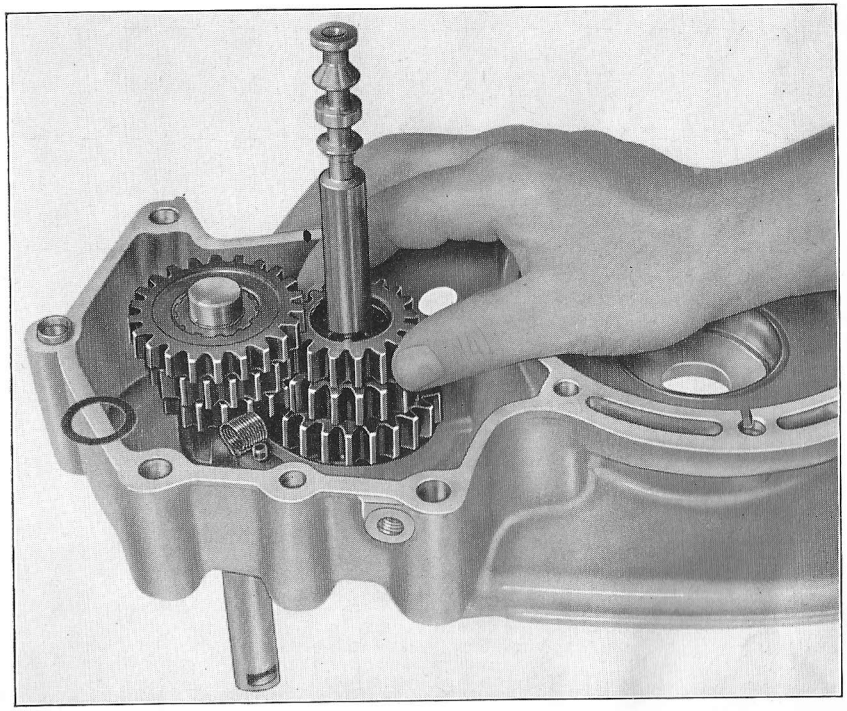
Now determine dimension A (e. g. A = 31.6). Dimension A is the distance from the outside of the left hand housing part to the hub of the largest sliding wheel (1st speed).

Take off left hand half.

Determine dimension B (e. g. B = 31.5). Dimension B is the distance from the collar of the bearing ring to the end of the final drive shaft.

Determine Dimension C (e. g. C = 21.0). Dimension C is the wall-thickness of the housing.

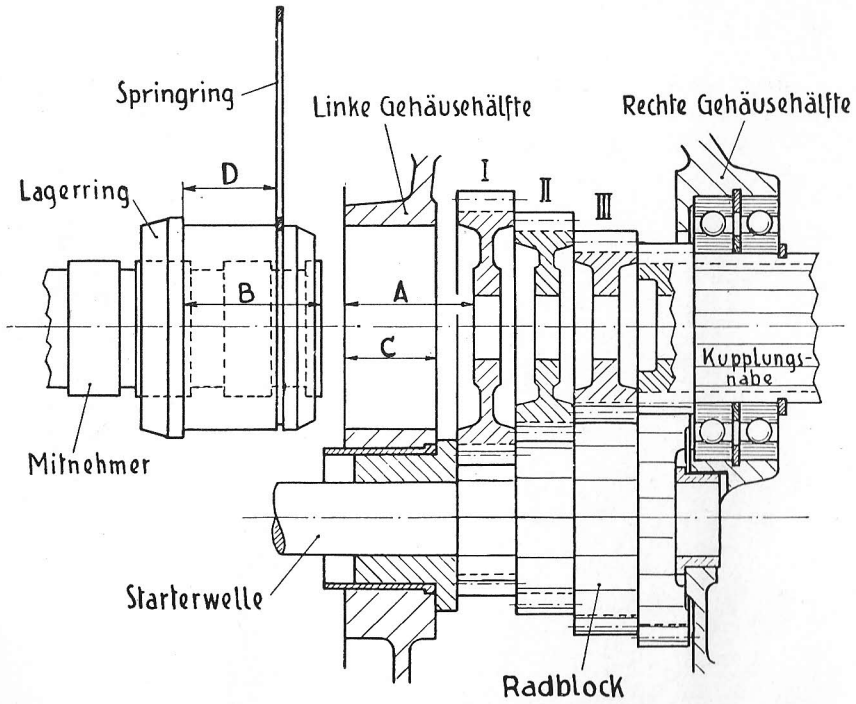
Determine Dimension D (e. g. D = 22.5). Dimension D is the distance from the collar of the bearing ring to the snap ring. Dimension D will always be larger than C so that, by readjusting the bearing ring in the housing, the correct axial play can be obtained.



Since in this particular case dimension A is larger than B, for 0,1 mm, there must be 0,1 mm of play between the hub of the large sliding wheel (1st speed) and the final drive shaft's end. Dimension D, in this case, is 1.5 mm larger than C. Equalize difference by using washers

1301 z 603	0.5 mm strength
1301 z 604	0.4 mm strength
1301 z 605	0.3 mm strength.

In order to obtain **0,4 mm** of play between the hub of the large sliding wheel and the final drive shaft's end, use 0,3 mm of the total difference of 1.5 mm between the collar of the bearing ring and the outside of the left-hand crankcase half; also 1.2 mm are put in between the inside of the left-hand crankcase half and the snap ring.



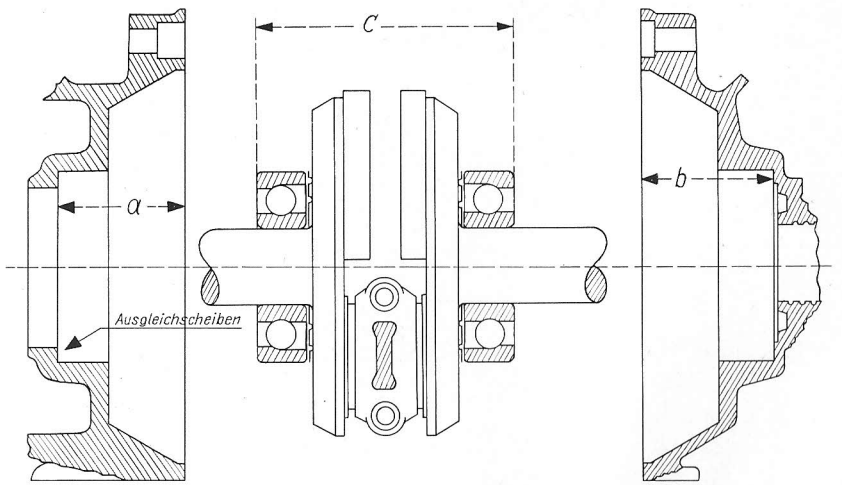
Springring = snap ring
Lagerring = bearing ring
Linke Gehäusehälfte = left-hand housing half
Rechte Gehäusehälfte = right-hand housing half
Kupplungsnabe = clutch hub
Mitnehmer = final drive shaft
Starterwelle = starter shaft
Radblock = wheel block

Dimensions A, B, and C are variable. When mounting the selector shaft make sure that the balls for arresting the different speeds are pointing towards the sinkings in the final drive shaft.

The final drive shaft can only be mounted with heated housing, and locked in position by the snap ring provided therefor.

5. **Dimensioning the Crankshaft Bearings**

Different Main Bearings have been fitted for the different models. Starter engines, at the starter side, have an additional roller bearing, the position of which does not have to be measured. Fundamentally it must be kept in mind that only such types of bearings are fitted which were used before. The axial play of the crankshaft should not exceed 0.1 mm as a minimum, and as a maximum 0.2 mm. Too tight fit means excessive wear on bearings, decreased output, and rough engine running. Excessive axial play also means rapid bearing wear and unsteady running.



Ausgleichscheiben = spacer shims

The external rings of the crankshaft bearing are pressed against the resilient discs located behind it, and dimension C is determined. Then determine dimensions A and B, and add them. A + B will always be greater than C. In the left-hand ball bearing seat (generator side) insert washers

1301 z 1003	0.05 mm strength
1301 z 1004	0.1 mm strength
1301 z 1005	0.15 mm strength

until the crankshaft shows the correct amount of play.

When forcing on the deep-groove bearing inside rings simultaneously force on the protective washer concentrically by means of a pilot ring.

When converting the engine from the ball bearing — and — roller bearing design to the 2 ball bearings design, remove the collar projecting by approx. 2 mm at the bearing seat of the right-hand housing half.

6. **Joining the two Housing Halves**

After the crankshaft-bearing outside rings and the packing ring (oil hole must be free after forcing in) have been mounted on the generator side of the heated housing, the selector shaft is introduced into the corresponding grooves of the final drive shaft. Make sure that the arresting balls actually engage with the sinkings in the final drive shaft provided therefor.

There are selector shafts with

2 balls and 2 springs
4 balls and 2 springs
3 balls and 2 springs.

The latter design has shown the best results. Conversion to newest design can be made without difficulty.

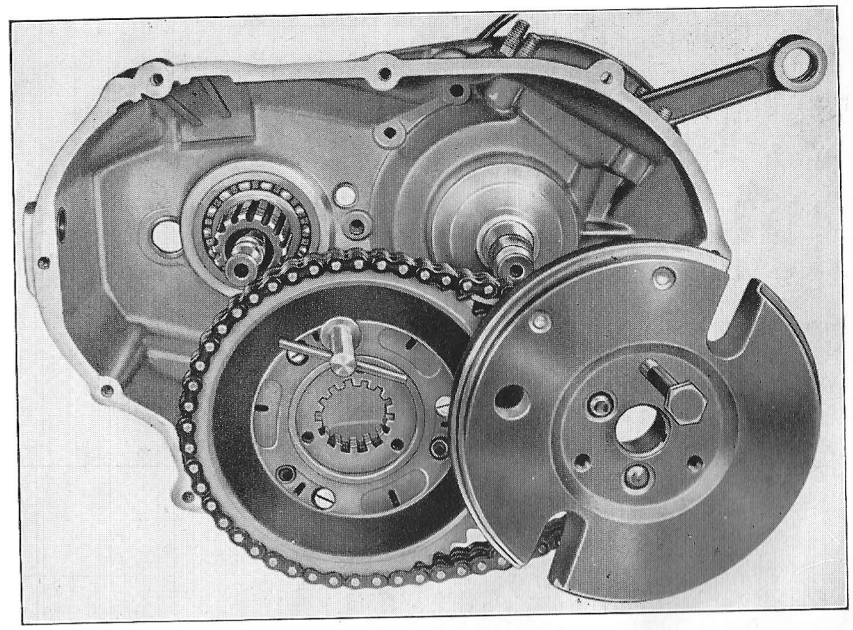
After having mounted the selector shaft, the starter shaft is now mounted together with washers and bearing bush, subsequently the sliding wheels are put onto the selector shaft and the wheel block onto the starter shaft. Then the pre-assembled crankshaft is mounted into the left-hand housing half (see chapter 1.). Treat packings with special care! Test correct functioning of engaging pin for starter actuation by rotating the wheel block.

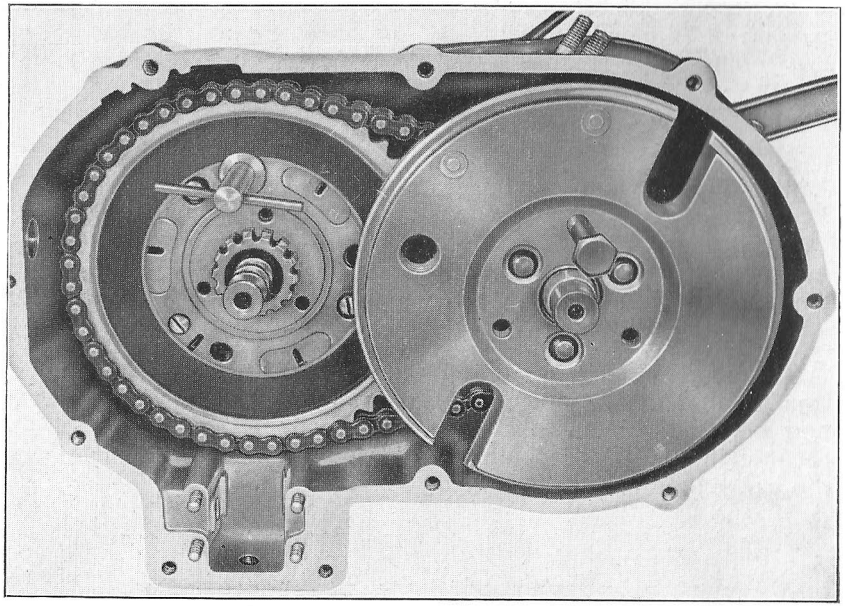
Now provide packing surfaces of both housing halves with a coating of Teroson-Atmosite and join them. Do not use force; by just turning the clutch hub the gearing will engage much more easily.

7. **Mounting the Clutch with Primary Chain and Flywheel**

The clutch assembly ready for mounting (see chapter 3 — pre-assembling) is pushed onto clutch hub and crankshaft stub (simultaneously) together with chain and flywheel (after the woodruff key for retaining the flywheel has been put in).

Subsequently mount 1st circlip on the clutch hub. Now push on the bearing ring of the clutch sprocket, remove the clamping screw, and put on the front disc in such a way that the 3 holes which receive the push rods correspond. Finally, mount 2nd circlip on the clutch hub.



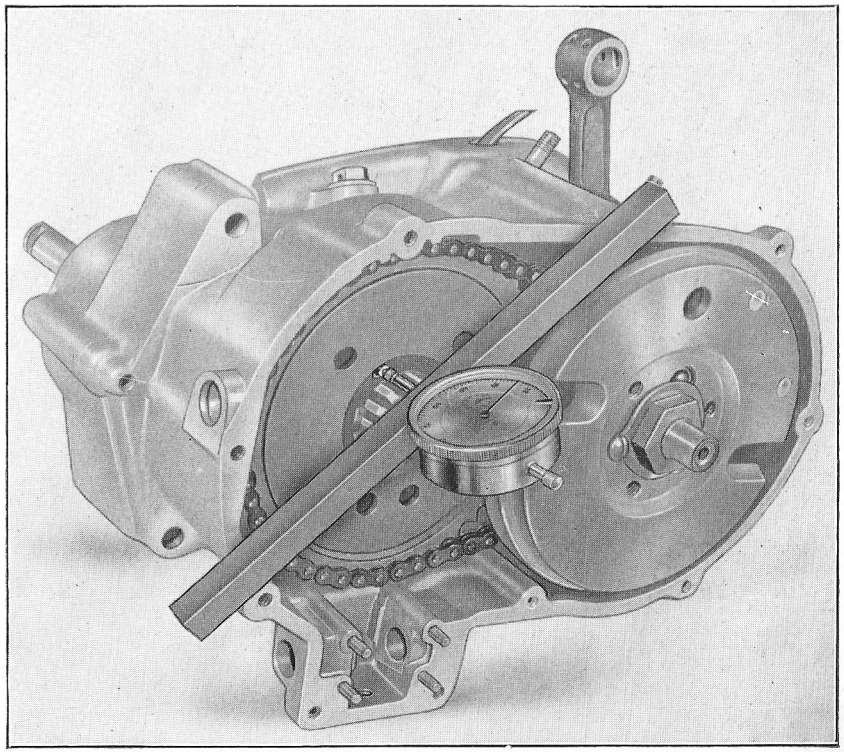


Now remove the 3 tension bolts uniformly and fasten the flywheel. The nut has left-hand thread, press the safety washer on one side against a recess in the flywheel, on the off side knock against the nut side.

8. Determining the Dimensions of Clutch Push Rods and Supporting Bolt

For noiseless working and a minimum of clutch wear the exact dimensioning of the push rods is of the utmost importance. The pressure ring must not have more than 0.02—0.03 mm of play; if it has more, rebuild the rods accordingly. For measuring the push rods use a ruler with dial gage.

After the pressure ring has been pushed over the clutch hub, the clutch pressure bar (disengaging shaft) can be mounted (for easier mounting, recesses have been provided for). Do not forget to insert external rubber packing.

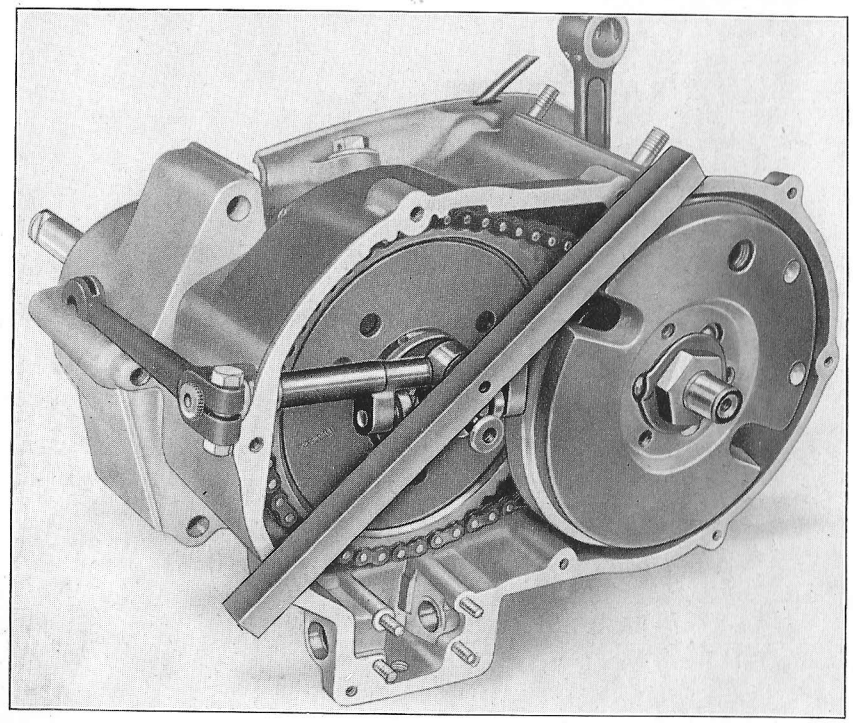


The clutch pressure bars of older design (ball bearings instead of rollers) can be interchanged against such of recent design without difficulty. In this case, however, the pressure ring must also be replaced. The right hand gear selector finger should be ground down on its right-hand side to such an extent as to prevent it from touching the roller on the pressure bar.

Make sure the ground portion has a smooth edge, i. e. no steps.

Dimensioning the supporting bolt in the clutch cover is done as follows:

The supporting bolt is taken out of the cover and inserted into a ruler of approx. 250 mm length. The ruler, in its center, has a hole of 8.0 mm ϕ designed to receive the supporting bolt.

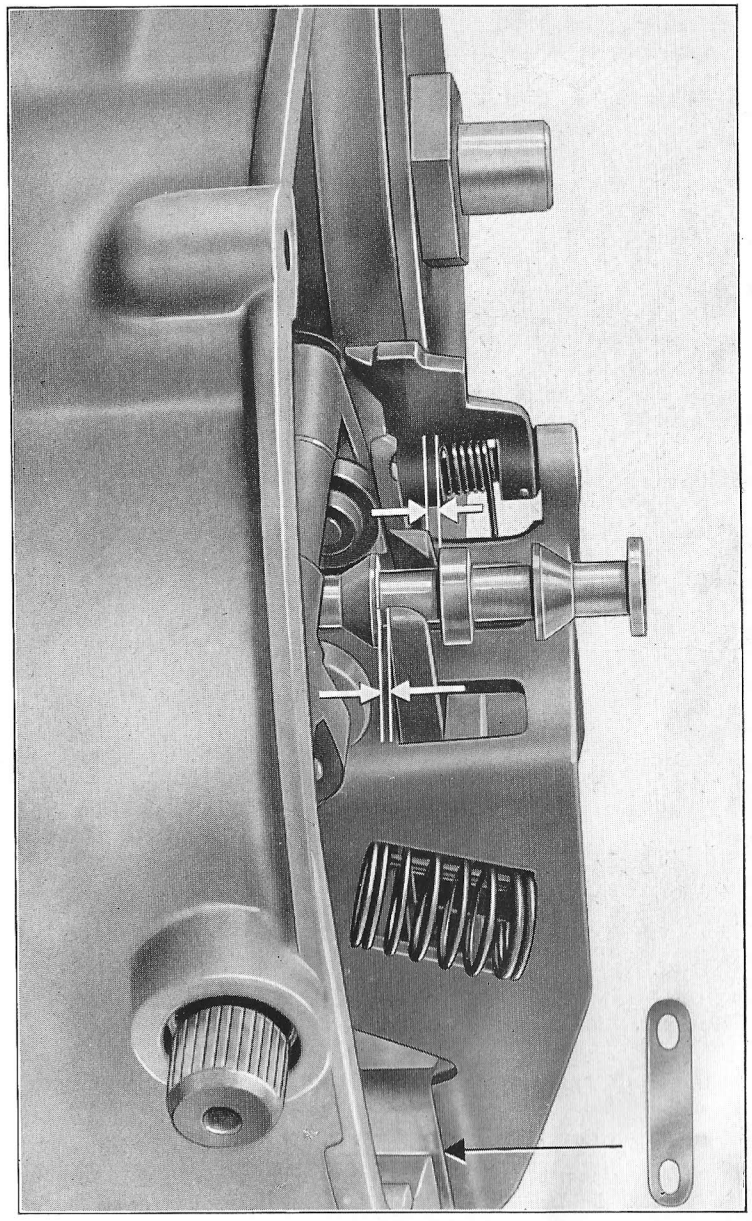


The ruler is laid across the housing in such a way that the pressure bar fits into the milled-out portion of the supporting bolt (if cover has paper packing, put the latter under the ruler during measuring). By making the two rollers touch the pressure ring the play between pressure bar and supporting bolt may be seen, provided that both rollers touch uniformly. The play can be corrected by adding the following spacers:

1301 z 52	0.2 mm strength
1301 z 616	0.1 mm strength.

These spacers must be put in before mounting the supporting bolt in the housing cover between supporting bolt and cover.

9. Mounting and Adjusting the Gearshift Mechanism



The gear selector support is mounted in such a way as to permit the spring and the selector fingers of the gear selector fork to engage the recesses in the selector shaft. Subsequently, screw down gear selector support temporarily.

After the foot-change lever has been mounted on the small footshift shaft, check whether in each speed position of the selector shaft the surfaces of the selector fingers have equal distances from the selector shaft flanges in front and behind, if not, add spacers

1281 z 242	0.5 mm strength
1281 z 243	0.2 mm strength
1281 z 244	0.1 mm strength

equally on right and left.

Now fasten gear selector support.

10. **Mounting the Clutch Housing Cover**

The crankshaft bearing is inserted with the housing cover heated. It is not necessary, however, to measure the bearing seat. The supporting bolt (see chapter 8) to the clutch pressure bar must be mounted in such a way that the support surface is in exact horizontal position, whereby the lateral milled-out portion must correspond with that located at the housing cover.

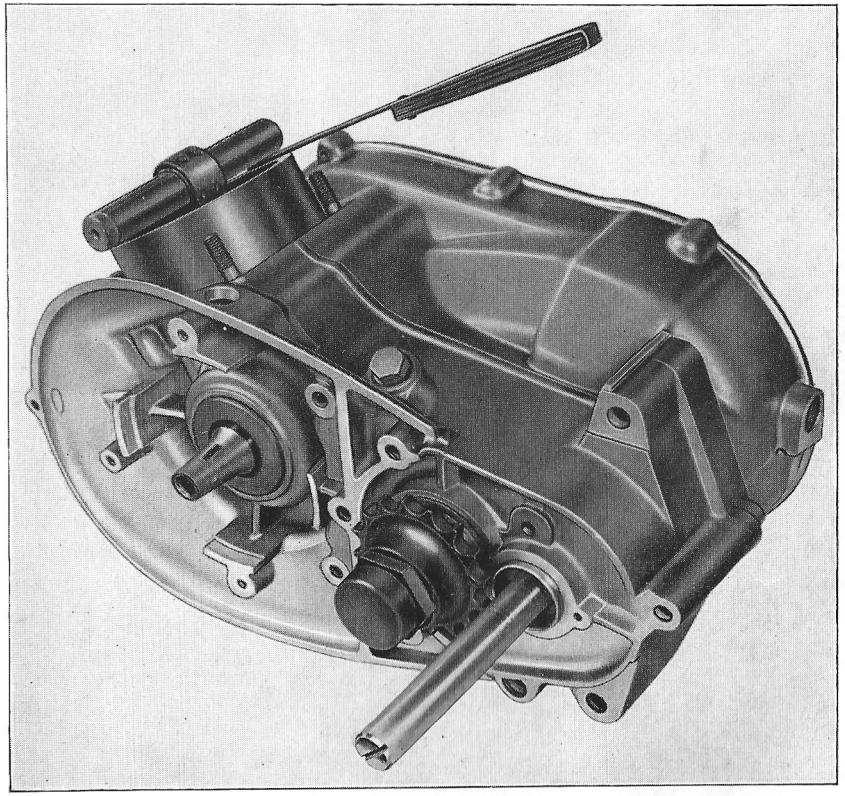
Mounting the idle indicator device, which must be secured by means of a snap ring, does not present any difficulties. The moment for engaging comes automatically. If the device should not function properly, replace, or bend, contact lever. After having mounted the bearing, the supporting bolt, and — with scooters as well as with Elastic 250 and 250 S engines — the idle indicator device, the cover can be screwed on after it has been provided with a coat of Teroson-Atmosite, or after a paper gasket has been provided. Tighten screws in diagonal order, and with increasing force.

11. **Mounting the Drive Sprocket**

With the hub pointing away from the engine, the sprocket is pushed onto the final drive shaft, a lock washer is added, and the cap nut tightened. For better retaining, flap the washer at the one side against the hub of the sprocket and at the off side against the nut.

12. **Mounting the Piston**

Correct connecting rod alignment is of the utmost importance. A gaging ring 2501 k 73-0 = ZWN 784 is laid on the engine housing as shown in our illustration. Now a ground gaging pin 2501 k 63-0 = ZWN 738 is inserted through the gudgeon pin bearing of the connecting rod, and the connecting rod moved in such a way as to cause the gage pin to touch the ring. Now — if necessary — move the connecting rod until the gage pin and the ring are exactly parallel.



The connecting rod has at its small end, the gudgeon pin at its hole, and the piston at the gudgeon pin boss, green or blue marks which, at all times, must correspond, i. e. all three parts must bear green, or blue, marks in order to guarantee that the correct dimensions are given.

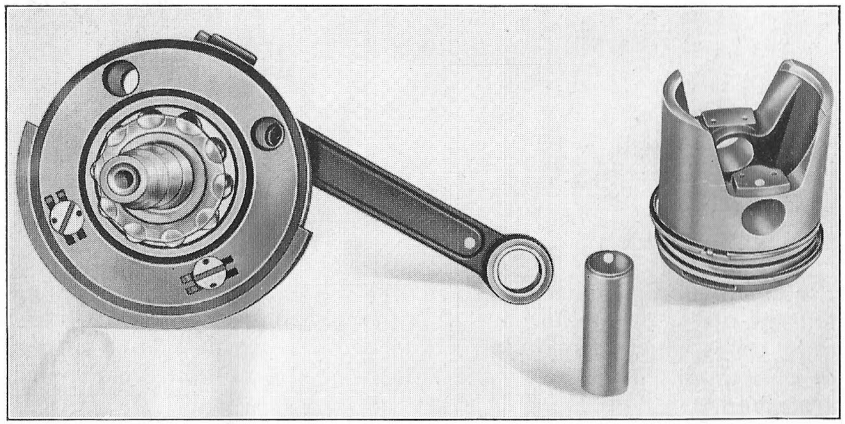
Special attention should be paid to the mark "vorn" = "front" on the piston head, and to the stamped-in dimension. The piston must be mounted

with Bella R 150, R 151	with 0.05 mm of play
DB 202 Comfort Norma, Norma-Luxus Elastic 200, Elastic 250 175 S, 200 S, 201 S, 250 S Bella R 153, R 154, R 200, R 201, R 203	with 0.06 mm of play.

Mounting the piston rings on the piston is done by hand or by means of a commercially available tool; first the lowest, and last the uppermost ring. Make sure the piston is not damaged. After on one piston side the internal circlip has been mounted, fix the piston by inserting the gudgeon pin. Now fit the second circlip (with older models, heat the piston to 185° F.).

Important!

Never replace rings on run-in pistons. In each case the cylinder must be rebored, and the piston together with rings, gudgeon pin, and, if necessary, gudgeon pin bushing must be replaced.



13. **Mounting the Cylinder and Cylinder Cover**

The cylinder flange gasket is provided with a coating of oil and laid down on the housing. Subsequently oil piston rings well, compress them by means of a clip, and push on cylinder slowly and without applying force. Do not disalign the cylinder during this job, as otherwise the connecting rod may become bent.

Now the cylinder bolts can be tightened in diagonal order with increasing force. After approx. 10 working hours the nuts are tightened once more, likewise the screws for the cylinder cover which is fitted after the correct gasket has been put on.

14. **Mounting the Generator; Ignition Timing**

After having applied the Woodruff key, mount the armature of the generator and the generator housing. Below, the correct ignition timing is described in detail:

Check contacts — if necessary, clean contacts, or replace. Adjust contact gap. Cleaning or readjusting contacts later on means incorrect spark timing, e. g.;

Changing the gap by 0.1 mm means changing the ignition timing by 10°. The breaker contact gap is adjusted to 0.3 — 0.4 mm. This is done by loosening the set screw of the contact bracket, subsequent turning of the eccentric screw, and, finally, retightening the set screw.

Instead of the armature fixing bolt, the graduaded disc is now screwed on with a hex screw M 10 × 85. Secure the screw by means of a lock nut.

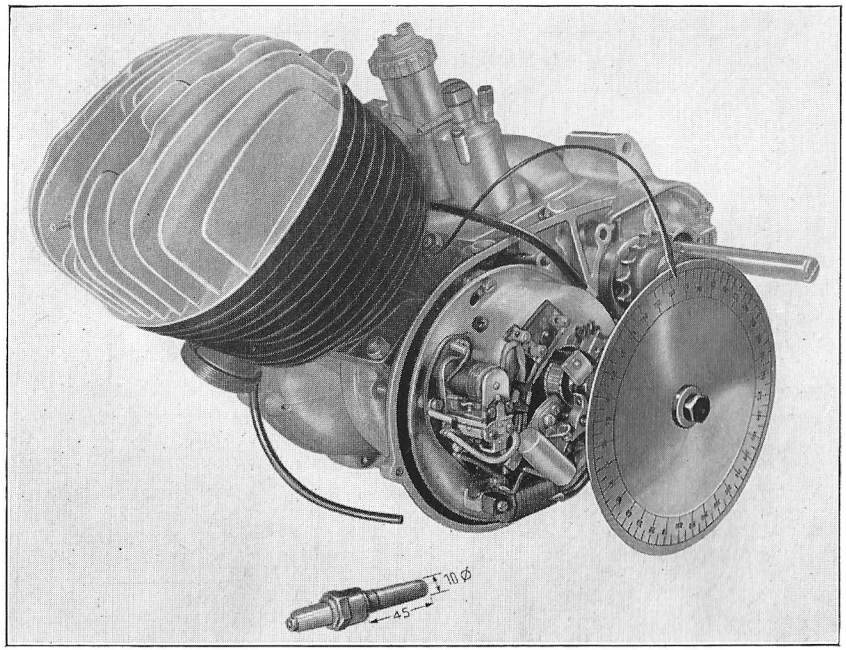
Now a wire indicator needle is made and mounted on the rear left-hand cylinder bolt in such a way as to cause the indicator end to point towards the disc's dial.

A sparkplug you have to rebuild is screwed into the cylinder cover so that it projects into the piston travel by 30 mm.

Now the crankshaft is turned until the piston touches the adjusting plug; the position of the dial is marked with a pencil etc. (e. g. 162°).

Now the crankshaft is again turned in opposite direction until the piston touches. Make another mark on the dial (e. g. 30°). Now count the number of degrees between the two marks, i. e. the sector over which the indicator did **not** travel (here 132°).

The central position between the two marks on the graduated disc corresponds with the top dead center for the piston (here 132° : 2 = 66°, the 66° substracted from 162°, or added to 30° results in a top dead center of 96°).



Now remove the adjusting spark plug again. Turn the crankshaft until the number indicating the top dead center on the dial, is opposite the indicator, then turn it backwards in opposite direction to the direction of rotation (all engines turn left) by the number of degrees necessary for advanced timing, i. e. for

DB 202	17.5 — 21.5°
Norma	23°
Norma-Luxus	23°
Comfort	23°
Elastic 200	23°
Elastic 250	26.5°
175 S, 200 S, 201 S	24.5°
250 S	23°
Bella R 150/R 151	23°
Bella R 153/R 154	23.5°
Bella R 200/R 201	23°
Bella R 203	22.5°

When thus adjusting advanced timing, the contact breaker must just open; the correct timing can be obtained by loosening the set screw of the generator, and turning the generator housing accordingly. For scooters with starter, correct timing is obtained by moving the segment which carries breaker hammer and contact bracket.

For determining the correct opening time for the two breaker points, it is recommended to use a lamp. Proceed as follows:

A light cable is connected with the engine block and the negative pole of a battery. A second cable connects the positive pole and the lamp, and from there it leads to the breaker hammer. The exact moment of breaking is when the lamp just lights up or goes out.

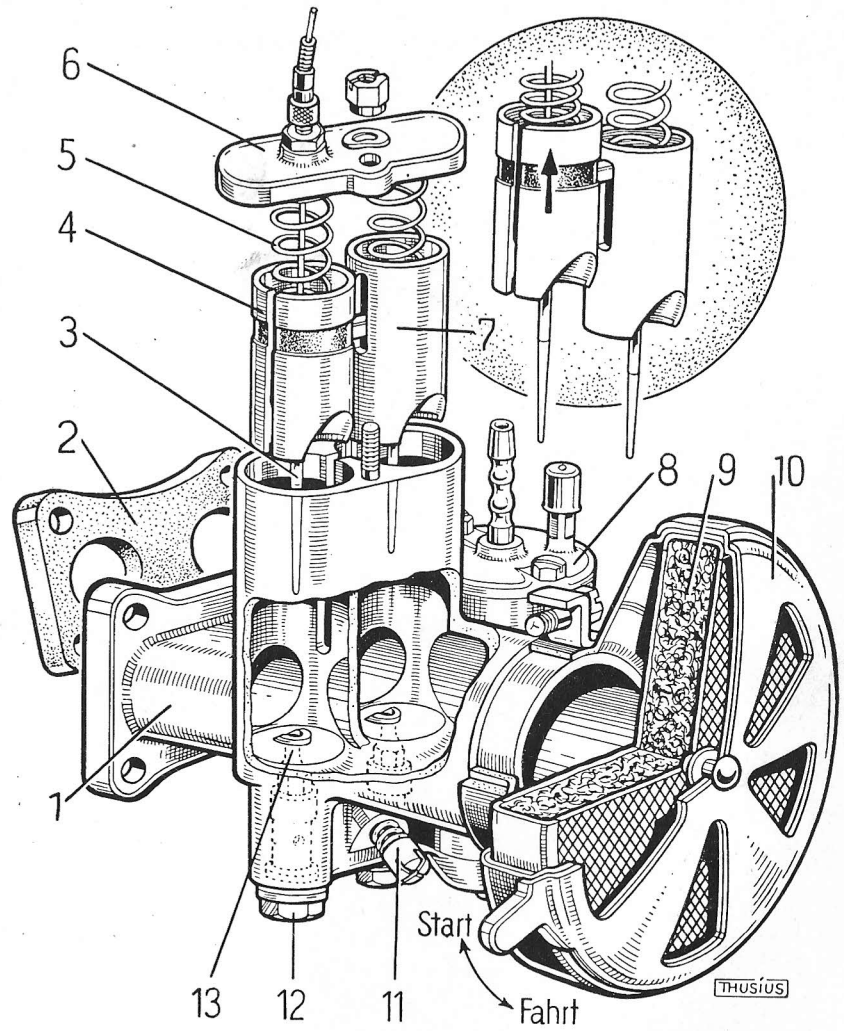
15. Various Types of Carburettors and how to Adjust them

a) **Comfort**
Norma
Norma-Luxus
Elastic 200.

These models are equipped with a so-called duplex carburettor. The latter design offers the advantage, by the special arrangement of the intake cross-sections and their gradual operation, of practically uniform intake speeds over a wider speed range.

Carburettor Adjustment

	Comfort Norma Norma-Luxus		Elastic 200	
Carburettor type "Bing"	18/17/3		18/17/4	
	left Main Carburettor	right Auxiliary Carburettor	left Main Carburettor	right Auxiliary Carburettor
Opening (mm)	18	17	18	17
Main Jet	90	70	90	70
Needle Position from Top, Groove	3	1	3	2
Air Adjusting Screw, Turns Open	1 1/2—2		1 1/2—2	
Idle Jet	35		35	
Needle Jet	2.62	2.60	2.62	2.60



1 Carburettor Housing
2 Insulating Flange
3 Jet Needle
4 Gas Slide for Main Carburettor
5 Gas Slide Coil Spring
6 Cover Plate
7 Gas Slide for Auxiliary Carburettor
8 Float Chamber
9 Air Cleaner
10 Throttle for Air Cleaner
11 Air Adjusting Screw
12 Jet Base
13 Needle jet

Start = Starting
Fahrt = Driving

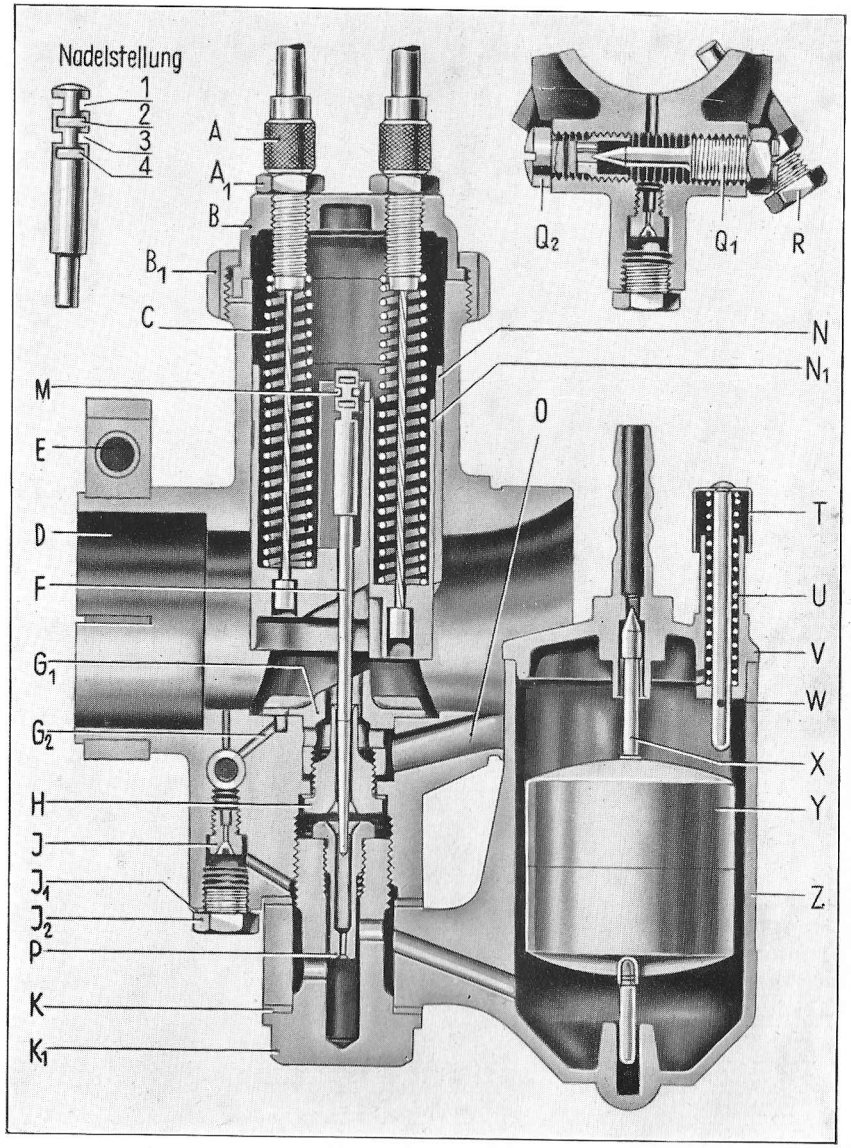
b) **DB 202**
Bella R 150 without electric starter
175 S
200 S
201 S
250 S

Abovementioned models have Bing Two-Slide Carburettors.

Adjustment

	DB 202	Bella R150 without starter	175 S	200 S	200 S 201 S	250 S
Carburettor Type "Bing"	2/22/13	2/20/15	2/24/46	2/24/42	2/24/46	2/26/51
Opening (mm)	22	20	24	24	24	26
Main Jet	95	90	110	120	110	120
Needle Position from Top, Groove	1	2	2	2	2	3
Air Adjusting Screw, Turns Open	2½	1—1½	1—1½	1½—2	1—1½	1—1½
Mixing Chamber Insert	4	3	5	5	5	5
Idle Jet	40	40	45	45	45	40
Needle Jet	—	2.68	2.75	2.70	2.70	2.70

A Adjusting Screw
A1 Nut
B Cover Plate
B1 Cover Screwing
C Slide Spring
D Carburettor Housing
E Clamping Screw
F Jet Needle
G1 Mixing Chamber Insert
G2 Pilot "Progression" Canal
H Needle Jet
J Idle or Pilot Jet
J1 Packing Washer
J2 Screw
K Gasket
K1 Jet Base
M Jet Needle
N Gas Slide
N1 Air Slide
O Atomizer Bore
P Main Jet
Q1 Air Adjusting Screw
Q2 Pilot or Idle Air Jet
R Slide Stop Screw
T Tickler
U Tickler Spring
V Float Chamber Cover
W Split Pin
X Float Needle
Y Float
Z Float Chamber



Nadelstellung = position of needle

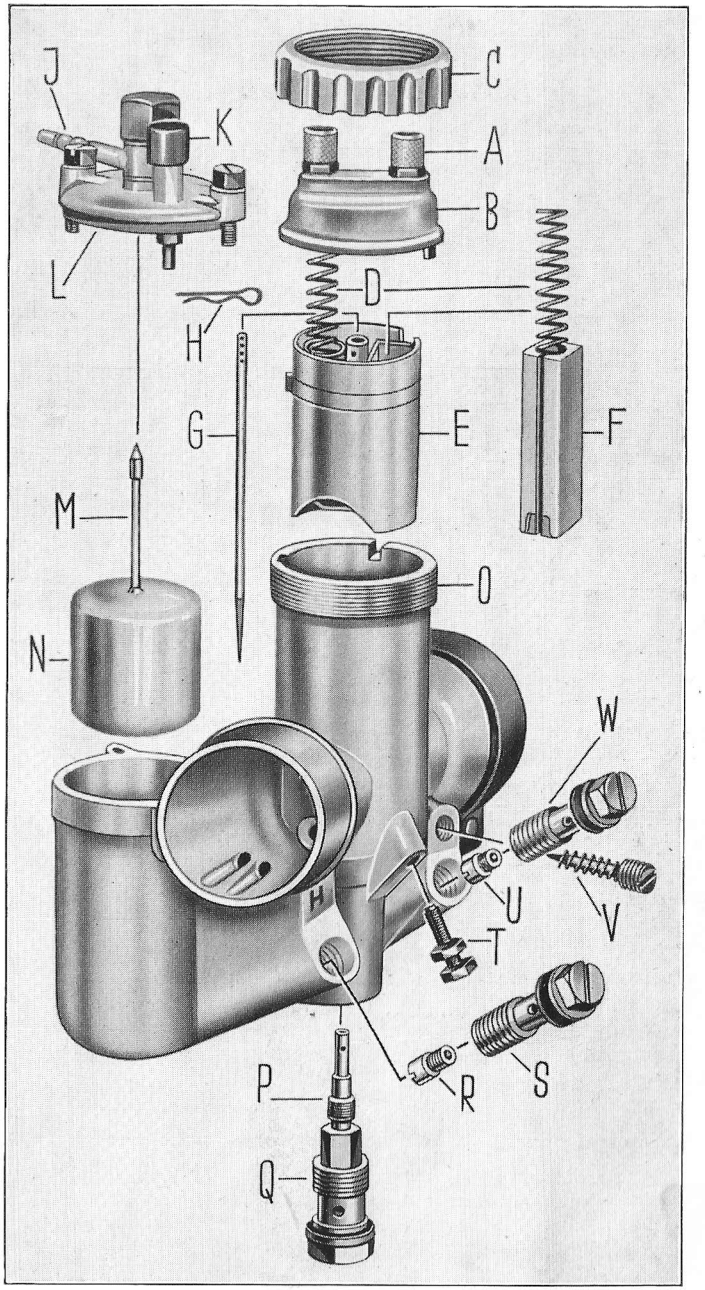
c) **Bella R 200** without electric starter
Elastic 250

Both models are equipped with oblique-jet carburettors.

Adjustment

	Bella R 200 without starter	changed only by plate under cylinder	Elastic 250
Carburettor Type "Bing"	2/24/40	2/24/40	2/26/34
Opening (mm)	24	24	26
Main Jet	110	105	125
Needle Position From Top, Groove	3	3	3
Air Adjusting Screw, Turns Open	1 1/2	1 1/2	1 1/2—2
Mixing Chamber Insert	—	—	—
Idle Jet	35	40	40
Needle Jet	1508	1608	2.76

A Adjusting Screw
B Cover Plate
C Cover Screwing
D Slide Spring
E Gas Slide
F Air Slide
G Jet Needle
H Clip
J Hose Connection
K Tickler
L Float Chamber Cover
M Float Needle
N Float
O Carburettor Housing
P Needle Jet
Q Bottom Screw
R Main Jet
S Jet Bolt
T Slide Stop Screw
U Idle Jet
V Air Adjusting Screw
W Jet Bolt



d) **Bella R 151, R 153, R 154**
Bella R 201, R 203 } with electric starter

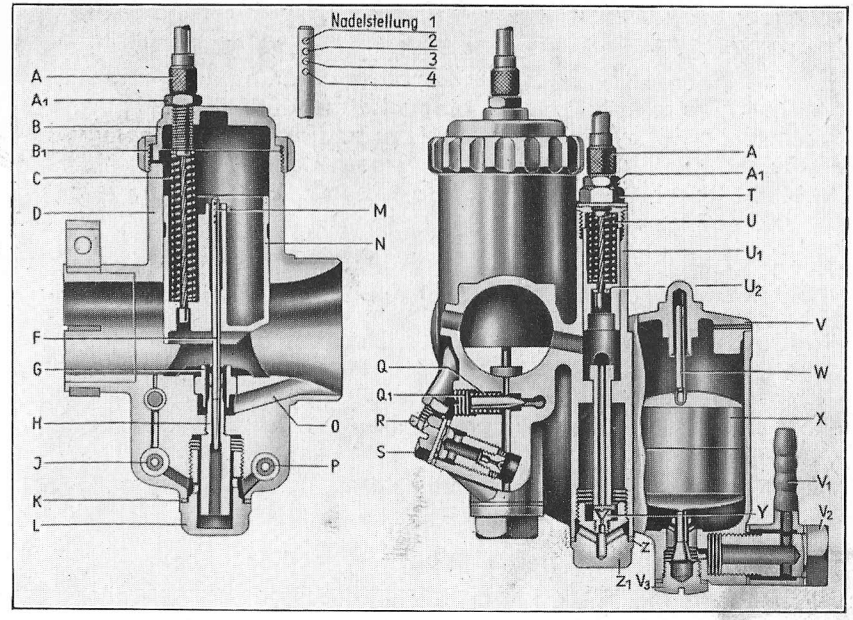
These scooter models are equipped with oblique-jet starter carburettors. Similar design as described under c). The air slide and the tickler at the float chamber were eliminated. A so-called starter jet system was added which, whenever the respective lever is actuated, provides the engine with a combustible fuel-air mixture while the engine is being started.

Adjustment

	Bella R 151 with starter		Bella R153/R154 with starter	Bella R154 with starter
Carburettor Type "Bing"	1/20/15	1/20/19	1/20/19	1/20/38*)
Opening (mm)	20	20	20	20
Main Jet	110	110	110	105
Needle Position from Top, Groove	2	3	3	3
Air Adjusting Screw, Turns Open	1 1/2	1 1/2	1 1/2—2	1 1/2
Mixing Chamber Insert	—	—	—	—
Idle Jet	45	45	45	45
Needle Jet	1508	1508	1508	1508
Starter Jet	70	80	80	80

	Bella R 201 with starter		Bella R 203 with starter		
Carburettor Type "Bing"	1/22/79	1/22/89	1/22/89	1/22/96*)	1/22/110*)
Opening (mm)	22	22	22	22	22
Main Jet	110	105	105	100	110
Needle Position from Top, Groove	3	3	3	3	3
Air Adjusting Screw, Turns Open	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Mixing Chamber Insert	—	—	—	—	—
Idle Jet	40	45	45	45	35
Needle Jet	1508	1508	1508	1508	1608
Starter Jet	70	85	85	85	85

*) in combination with intake silencer in right-hand cover flap



Nadelstellung = position of needle

A Adjusting Screw
A1 Lock Nut
B Cover Plate
B1 Cover Screwing
C Slide Spring
D Carburettor Housing
F Jet Needle
G Atomizer
H Needle Jet
J Idle Jet
K Packing Washer
L Bottom Nut
M Clip
N Gas Slide
O Atomizer Air Bore
P Main Jet
Q Spring
Q1 Idle Air Screw
R Slide Stop Screw
S Jet Bolt
T Top Screw
U Spring
U1 Housing
U2 Lock Washer
V Float Chamber Cover
V1 Hose Connection
V2 Screw
V3 Screw
W Float Needle
X Float
Y Starter Jet
Z Packing Washer
Z1 Screwing

A Few Hints on Correct Carburettor Tuning

It is the task of the carburettor to provide the engine in any speed range with a readily combustible fuel-air mixture. For this purpose, a number of jet systems have been provided for which deliver the correct mixture from idling to top speed. During idling the Idle or Pilot Jet system, consisting of Idle Jet, Idle Air Bore, and Idle Air Adjusting Screw, is in operation.

This system, during idling, operates alone; with increasing speed, it operates descreasingly in conjunction with the other systems.

With increasing speed, the Mixing Chamber Insert in connection with the Jet Needle and Needle Jet starts operating, later on the Jet Needle and Needle Jet are working alone.
Only at considerably high speeds the Main Jet starts functioning.

Important: With Comfort, Norma, Norma Luxus, and Elastic 200 (duplex carburettor)

Sequence of operation:

1. Idle Jet with Idle Air Bore and Idle Air Adjusting Screw
2. Jet Needle A with Needle Jet A
3. Main Jet A
4. Jet Needle B with Needle Jet B
5. Main Jet B
   Phase 4 begins with phase 3

In case of engine trouble originating in the fuel feed system always check in which speed range the trouble occurs, and check the jet system which operates in the speed range in question.

In case the engine "four-strokes" in a certain speed range, adjust for a leaner mixture for this range.

If the engine gets too hot, or tends to "pink" or to auto-ignition, adjust for richer mixture.

The idle air adjustment has been determined by the manufacturer and will be suited only for certain climatic conditions (Height over sea level, air humidity, air temperature etc.). We recommend that you readjust the idle air supply according to the following sequence:

Let engine idle, turn in gas slide stop screw until the engine runs with twist-grip closed; now screw in air adjusting screw as far as possible and unscrew slowly until engine runs in highest speed. From this point, give screw a turn inward of 90^0. Now unscrew gas slide stop screw until the engine runs at the desired idling speed.

E) Appendix

1. Special Tools

The following tools which can be ordered through our dealers at a very moderate price, are indispensable for all work on the two-stroke engine described herein. The greater part of these tools can also be used for repair jobs on other engine models.

1	Socket Wrench	2021 z 51
1	Knock-out Puller	2501 k 12-0 = ZWN 212
1	Gaging Ring	2501 k 73-0 = ZWN 784
1	Gaging Pin	2501 k 63-0 = ZWN 738
1	Squeezing Screw	2501 k 47-2 = ZWN 452
1	Puller or Extractor	2501 k 74-0 = ZWN 785
1	Clamping Screw	2500 k 10-0 = ZWN 786
3	Tension Bolts	2501 k 71-2 = ZWN 782
1	Knock-out Pin	2501 k 72-2 = ZWN 783
1	Graduated Disc	2500 k 2-0 = ZWN 392 E
1	Angular Wrench	2501 k 7-2 = ZWN 207 A
1	Socket Wrench	2501 k 10-2 = ZWN 208
1	Plug-in Screwdriver Blade	2501 k 11-0 = ZWN 211
1	Socket Wrench	2501 k 66-2 = ZWN 777

2. External Treatment of Engines

Engines are made to look like new if all aluminium parts (except the carburettor!) are sand-blasted and the cylinder painted with black nitro-lacquer. Such a treatment will make a favorable impression on the customer and convince him that also all other repair work is carried out as thoroughly and cleanly.

3. Engine Conservation

We recommend that you spray all engines which are not immediately used after they have been reconditioned with a coating of anticorrosive. The cylinder barrel and the crankshaft bearings should be treated with special care. The oil in the gearbox will not disturb this operation if the engine is kept in horizontal position.

4. Shipping Engines

Do not forget to drain out the oil in the gearbox. Especially sensitive parts should be covered with wood wool (mainly cylinder and generator). Pack the carburettor separately from the cylinder.

When shipping an engine to the factory send along carburettor and generator in each case.

5. Running-In the Engine

It would be ideal to run the engine in "no-load" for about an hour while it is mounted on a special stand. Running-in the engine in the chassis, however, is also sufficient. Increase the load gradually, i. e. run the engine in according to instructions that come with each engine model. A correct ratio of mix for the fuel-oil mixture is highly important.