BMW AG

INSTRUCTION BOOK
for the BMW Motor Cycles
Model R 12 and R 17

BMW

R 17 at the International Motor Car- and Motor-Cycle Exhibition in Berlin

INSTRUCTION BOOK

for the

BMW twin-cylinder models

R 12 750 c. c. touring

R 17 750 c. c. sports

BAYERISCHE MOTORENWERKE A.-G. MUNICH 13

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Index.

Preface.

The present manual brings in concise and yet detailed form a description of and service instructions for our pressed steel-frame motor cycles types R 12 and R 17. Both belong to the new 750 c. c. class, **R 12** being a **touring** and **R 17** a **sports model.**

From the first we wish to draw special attention to the absolutely novel suspension of the front wheel by means of a tubular fork with oil damper built in which combines simplicity of structure with excellent shock absorbing properties. Furthermore the four-speed gear used with this engine endows it with road performances far surpassing the average.

A thorough study of this manual is urgently recommended to all motor cyclists, particularly to beginners.

Munich, oct. 1936.

Bayerische Motoren Werke
Aktiengesellschaft
Munich 13.

Data of construction, performance, consumption, weight.

	R 12 1 carb.	R 12 2 carb.	R 17 2 carb.
Number of cylinders	2		
Arrangement of cylinders	horizontally opposed		
Cylinder bore	3,07" (78 mm)		3,27" (83 mm)
Piston stroke	3,07" (78 mm)		2,68" (68 mm)
Cylinder capacity	45,5 cu. in. (745 ccm)		44,5 cu. in. (730 ccm)
Normal number of revolutions per minute approx.	5400	4000	4500
Maximum speed	69 m. p. h.	75 m. p. h.	87 m. p. h.
Brake output (guaranteed continuous output) b. h. p.	18	20	33
Capacity of petrol tank approx.	3 gallons	3 gallons	3 gallons
Capacity of oil tank (in crankcase) approx.	3 3/4 pints	3 3/4 pints	3 3/4 pints
Fuel consumption (miles per gallon) approx.	70 — 80	65 — 70	55 — 65
Oil consumption (per 100 miles) pints (approx.)	1/4 to 1/2	1/4 to 1/2	1/4 to 1/2
Saddle height mtr.	0.70 / 2' 3 1/2"	0.70 / 2' 3 1/2"	0.70 / 2' 3 1/2"
Length of motor cycle mtr.	2.10 / 7' 0"	2.10 / 7' 0"	2.10 / 7' 0"
Width of motor cycle mtr.	0.90 / 2' 11"	0.90 / 2' 11"	0.90 / 2' 11"
Height of motor cycle mtr.	0.94 / 3' 1"	0.94 / 3' 1"	0.94 / 3' 1"
Wheelbase mtr.	1 38 / 4' 6 1/4"	1.38 / 4' 6 1/4"	1.38 / 4' 6 1/4"
Gear ratios:			
1st gear	1 : 3.18		
2nd gear	1 : 2.06		
3rd gear	1 : 1.42		
4th gear	1 : 1.09		
Reduction from gearbox to rear wheel: solo	1 : 4.07		
with sidecar	1 : 4.75		
Dimensions of tyres (wired tyres)	normally 26 × 3.50 low pressure, if desired 26 × 3.25 high pressure or for sidecar service 27 × 4 low pressure		
Weight of the motor cycle **ready for service,** with fuel tank **filled** approx.	188 kilos 414 lbs	188 kilos 414 lbs	186 kilos 410 lbs
Carrying capacity of the motor cycle approx.	210 kilos 460 lbs	210 kilos 460 lbs	210 kilos 460 lbs

Fig. 1
R 12 two-carburetter machine viewed from the off-side with lubrication chart (p.t.o.)

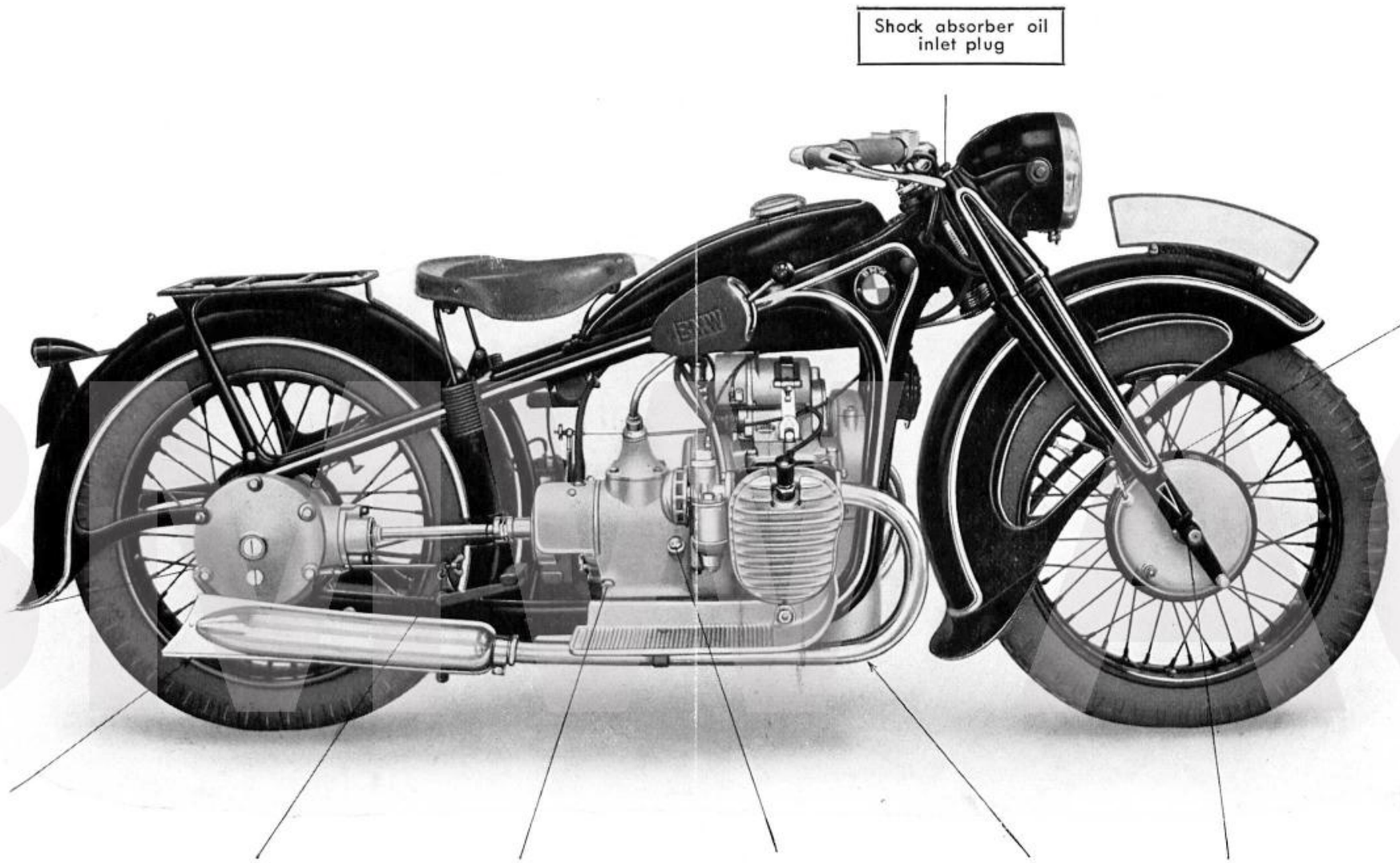


Fig. 1

R 12 two-carburetter machine viewed from the off-side with lubrication chart. Oiling points are the same on the R 17 model

Fig. 2
R 17 two-carburetter machine viewed from the kickstarter side with lubrication chart (p.t.o.)

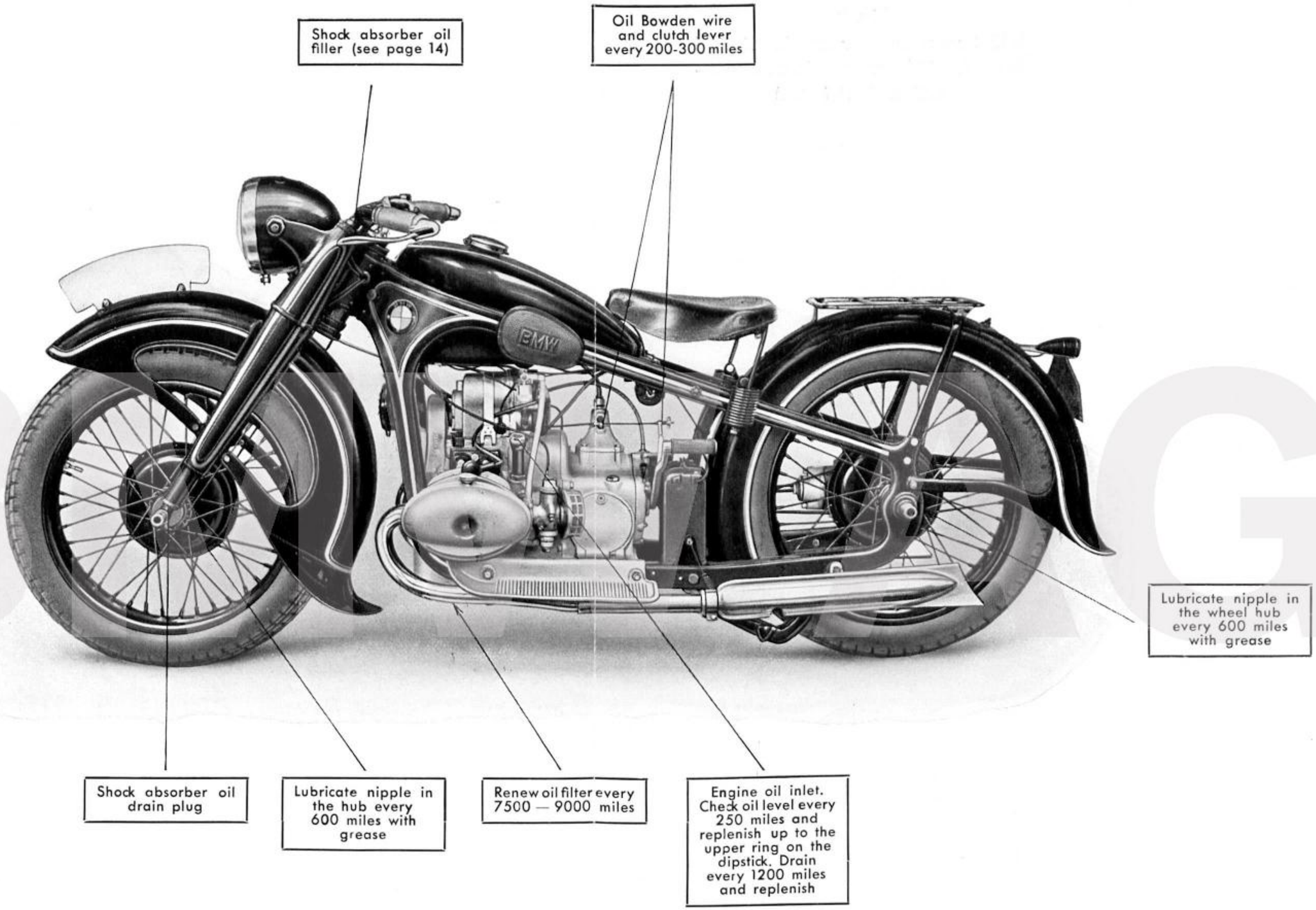


Fig. 2

R 17 two-carburetter machine viewed from the kickstarter side with lubrication chart. Oiling points are the same on the R 12 model

I. Operation.

1. Arrangement of the controls.

As shown in Fig. 4 most of the controls are arranged conveniently on the handlebars. At the right there is the throttle twist grip and the press-button for sounding the horn, further the headlamp dimming device and the front wheel brake lever. On the left side, there is the clutch lever and the ignition twist grip and in the middle of the handlebars there is the steering damper screw. The switch lever for the gearbox is guided inside a gate which forms the right kneegrip at the same time. The foot-lever to operate the rear wheel brake is arranged behind the right and the kickstart lever behind the left footboard.

2. Operation of the controls.

a) Throttle twist grip: The twist grip operating the gas slide valve or valves by bowden wires opens by being turned to the left, that is backwards, and closes by being turned to the right, that is forwards.

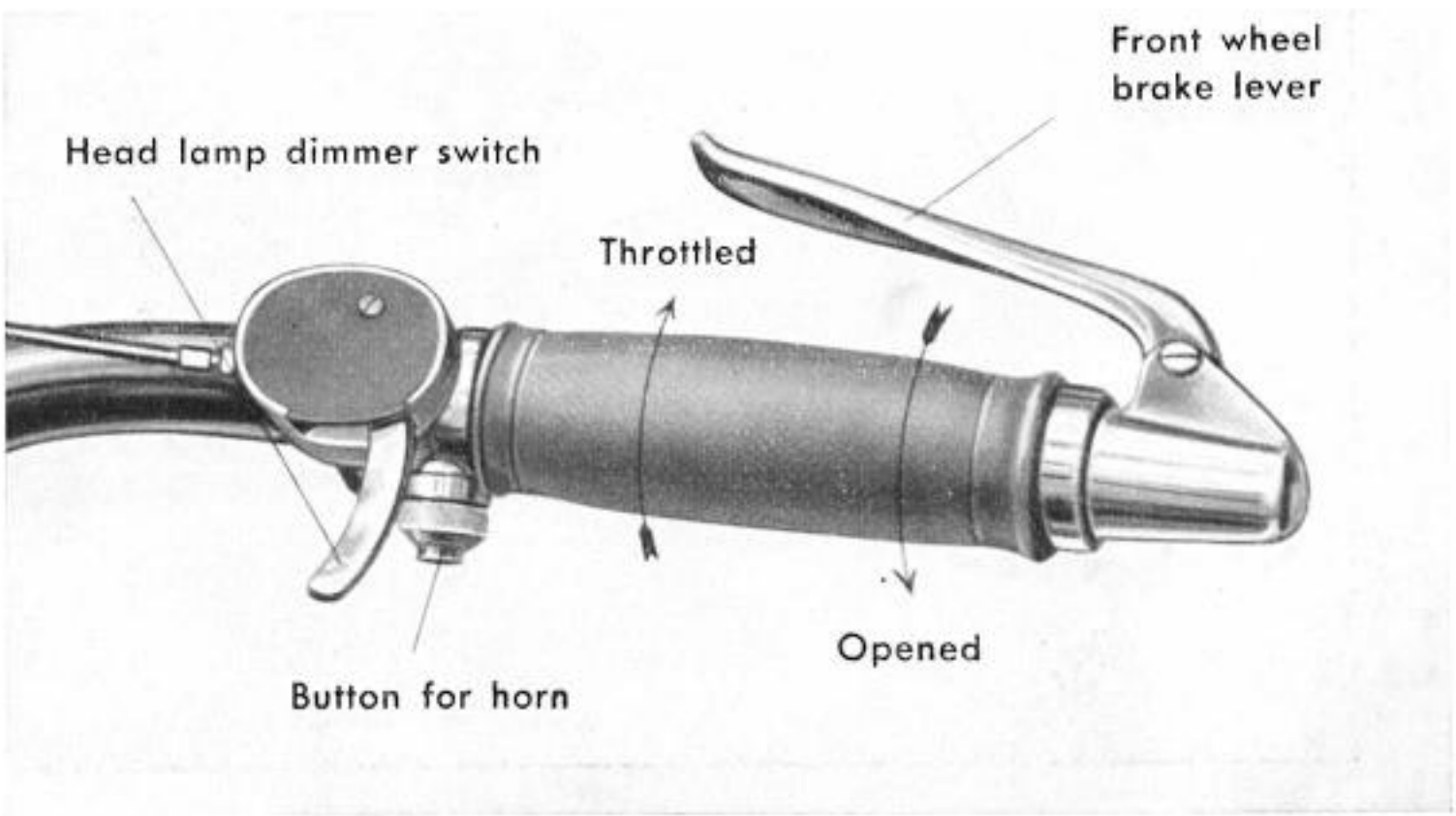


Fig. 3 Right end of handlebars (throttle twist grip)

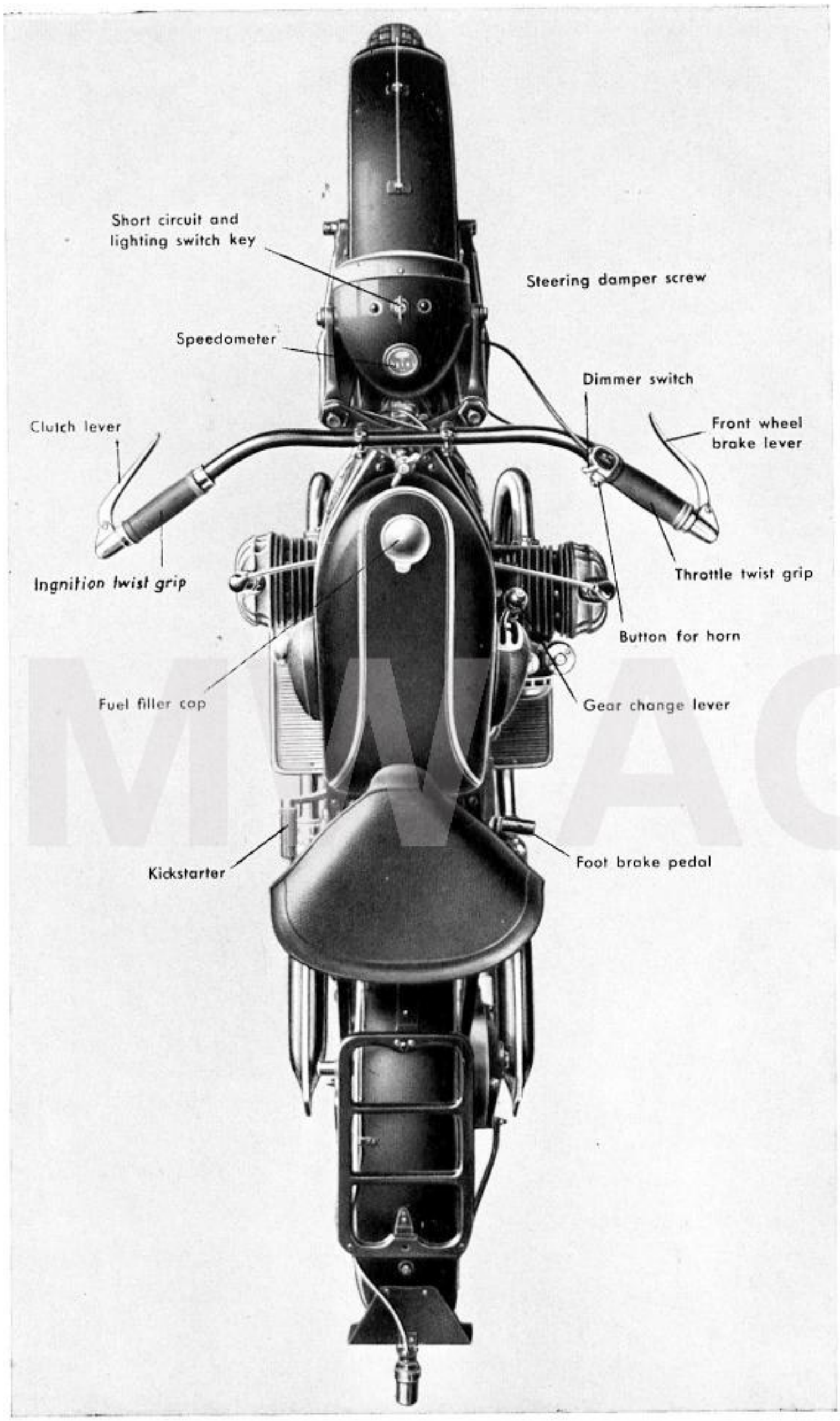


Fig. 4 The controls on the BMW motor cycle

b) Ingnition twist grip: The ignition twist grip, operating the adjustment lever of the contact breaker by means of bowden wire and thus changing the moment of breaking the contacts, adjusts the contact breaker to advanced ignition by being turned outwards (away from the cyclist) and to retarded ignition by being turned inwards (towards the cyclist).

To start the motor, turn the ignition twist grip to retarded ignition to avoid back-fire.

When the engine has warmed up, the ignition must be regulated according to the number of revolutions of the engine. For cruising with full speed on level road full advanced ignition should be adjusted normally. Any knocking of the engine, particularly when riding up-hill, is removed by retarding the ignition.

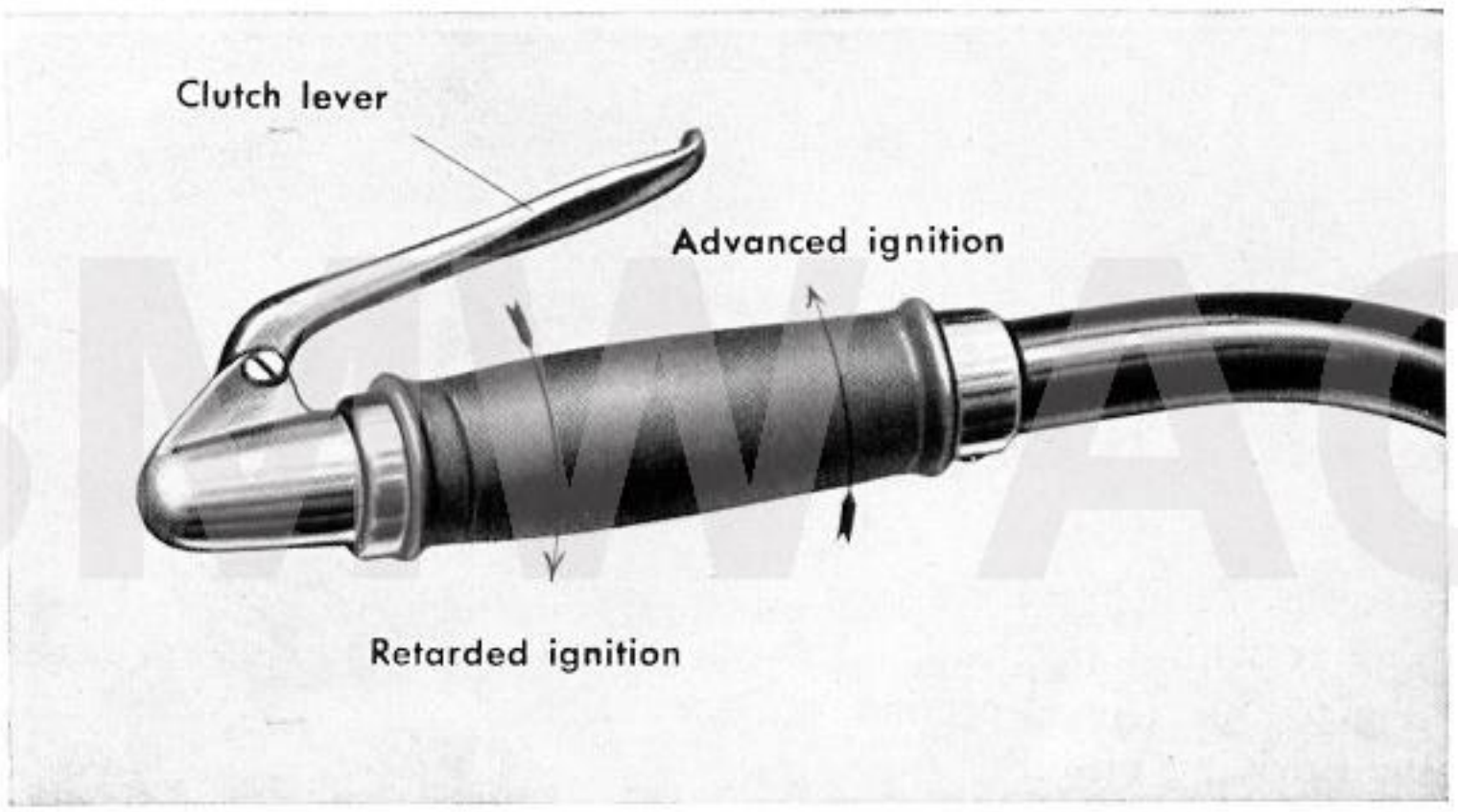


Fig. 5 Left end of handlebars (ignition twist grip)

As a general rule, retard the ignition, as soon as the motor starts knocking, until the knocking ceases.

c) Gear lever: Proper gear changing requires some practice for the beginner, though he will master it after a short time. When changing gear up (1st to 2nd, 2nd to 3rd, 3rd to top gear) declutch and throttle gas; when changing gear down throttle half-way which makes switching easier.

Use first gear for moving off only, and shortly afterwards engage second and then third gear, allowing the engine to remain in the latter gear for some time; if the town traffic is not too dense and on level roads engage

Fig. 6 Gear change lever

top gear. In dense town traffic third or second gear should be used. When cruising with top speed take care not to allow the speed to drop below 20 m. p. hr. on level ground, and not below 25 m. p. hr. with heavy load or when driving up-hill.

d) Brakes: Both brakes which are designed as internal expanding brakes, are highly effective and suffice also for cruising with side-car in any type of country. It is advisable to apply both brakes simultaneously, if possible, so as to ensure uniform wear. We recommend with prolonged down-hill riding to use hand and foot brake alone alternately so as not to heat them both simultaneously. On bends only the foot brake should be applied. When riding down steep hills, the engine should be used as a brake by engaging second or third gear.

e) Adjustment of the steering damper: In the middle of the handlebars a large wing nut is provided, by means of which the steering may be adjusted harder or softer according to road conditions.

f) With the **R 12 single carburetter machine** a short-circuit push button is arranged on the left half of the handlebars; it serves to stop the engine at the end of the cruise, and to reduce the speed quickly when taking bends or in the event of sudden appearance of obstacles.

3. Preparations for riding, and riding proper.

Make sure that the fuel tank is full and the oil tank in the engine is filled with oil up to the upper ring mark of the dipstick, the gearbox and rear wheel drive casing up to the lower threads of the inlets.

Before depressing the kickstarter, open the fuel tap located at the bottom of the tank, and press in fully the switchkey arranged on top of the head light; the pilot lamp gives a red light when the ignition is connected. Never keep the red light burning during prolonged stops, as otherwise the battery discharges through the lighting generator.

To set the cold engine in motion tickle both carburetters with the two-carburetter types and open the throttle twist grip about one third. Turn the ignition twist grip to retarded ignition.

With the R 12 single-carburetter machine operate the starting device on the carburetter by pulling out the starting piston and turning it to the right, keeping the throttle twist grip closed. (See also page 27.)

Make sure that the gear lever is in neutral position and then depress the kickstarter quickly and as vigorously as possible.

Let the cold engine warm up at medium engine speed: do not move off before the engine has well warmed up.

After the engine has been started in this manner and warmed up a little, **it is imperative with the R 12 single-carburetter machine to close the starting device by continuing to turn the starting piston, until the latter snaps back.** If this is omitted the natural consequence is a large consumption of fuel which also leads to the sparking plugs getting sooted.

A warm engine runs quietly at low speed with the gas slide valves closed.

To start the warm engine the throttle twist grip must be kept closed with the two-carburetter machines also, and operating the starting device or tickling the carburetters must be dispensed with, as otherwise there would be an excess of fuel for the starting which instead of facilitating the process would make it more difficult. The ignition lever must be opened half way. **In top gear at a speed of over 35 miles per hr. advance spark fully.**

It is not advisable to „gear through" that is to change over directly from 1st to 3rd gear, or from 2nd to top gear, or vice versa.

To stop the motor cycle, close throttle, pull the clutch lever and stop the motor cycle by applying the brakes, the engine continuing to work in neutral. In case of danger, close throttle and apply both brakes simultaneously **without** declutching as the engine acts as a brake; when the machine is almost at a standstill, one still might declutch quickly so as not to pull up the engine. Avoid, however, applying the brakes so harshly as to lock the wheels i. e., so that they start slipping. It is well known that the

braking effect is the greatest when the wheels are braked only to the extent of rolling on the road without slipping.

For prolonged stops (e. g. at traffic blocks) place the gear lever into neutral, and do not allow the motor to run with the clutch lever pulled.

The **engine is stopped** by pulling back the switch key to its lower stop. When the engine is stopped, close the fuel tap.

4. Lubricants and fuels.

For lubrication use only high grade engine oil for the **engine, gearbox** and **rear drive casing.** According to our experience we recommend **in summer and winter:**

for the engine and the gearbox: Gargoyle Mobiloil BB
for the rear drive casing: Gargoyle Mobiloil D.

In **summer the engine should be replenished with Gargoyle Mobiloil D** in particularly hot weather, in **winter Gargoyle Mobiloil Arctic** at temperatures below 50° Fahr.

For R 17 machines exclusively **Gargoyle Mobiloil D** or equivalent known brands of oil should be used in summer.

For taking part in competitions the **temporary** use of such racing oils as **Gargoyle Mobiloil R** is recommendable for **sports machines.**

The most suitable fuel is a mixture of petrol and benzol in equal parts. For the **R 17 sports machine exclusively** such mixtures must be used.

It is **absolutely necessary** to add to the fuel a good top lubricant e. g. **Gargoyle top lubricating oil** (according to the mixture chart attached to every can) with both types of engine during the running-in period.

If no special top lubricant is available, the oil prescribed for our engines might also be added to the fuel as a top lubricant by **way of substitute.** In this case the quantity of the oil added must not exceed 1 %.

To grease the nipples of the wheel hubs with the high pressure grease gun we recommend **Gargoyle Mobilgrease Nr. 4.** On no account use ordinary grease.

5. Running-in new machines.

Important.
Set the machine in motion with retarded ignition. Especially in cold weather allow the engine to run warm on the stand with medium engine speed or ride the first few miles slowly, so that the oil is pre-heated and becomes liquid. Heavy strain on the machine leads to trouble as the oil is viscous when cold and does not reach the places to be lubricated in sufficient quantity.

To run in the machine properly. Open the throttle for a short time, then close it again, that is allow the machine to run by momentum.

To have a certain guarantee for proper running-in, the carburetters of the machines newly delivered are supplied with a sealed throttle which provides for a limitation of the stroke of the gas slide. This pin must not be shortened until after 600 miles nor removed until after 1200 miles and this only by the competent representative. If the seal is damaged or the throttle pin altered without authority, any claim under guarantee will be forfeited.

The cruising speeds during the running-in period are as follows:

maximum speeds:	1st gear	2nd gear	3rd gear	top gear
from 0 — 600 miles	6	15	25	30 m. p. hr. must not be exceeded
from 600 — 1200 miles	10	20	35	45 m. p. hr. must not be exceeded.

These values apply to the R 12 touring models as well as to the R 17 sports models.

The above maximum speeds should only be maintained for distances from 200 to 500 yds., then the machine should be allowed to run the next equal distance with the engine cut off, etc. Between 1200 and 2000 miles limit the maximum speeds to short distances to begin with, that is **give full throttle only after 2000 miles for long distances.** Adjust the ignition lever in accordance with the number of revolutions, with low engine speed (during the running-in period) give only half spark advance. Give full advance only with high engine speed and low loads, i.e. in second or first gear on level ground.

After the running-in period the utmost care shonld be taken not to exceed in first, second and third gear the speeds marked red on the speedometer dial.

II. Maintenance.

1. General instructions.

All nuts and bolts must be checked for tightness in the beginning at short intervals. This is particularly important with the knock-out spindles, the crankcase and gearbox, the cylinder heads, the suction piping, luggage carrier and mudguards.

2. Lubrication.

All the oiling points indicated in figs. 1 and 2 must be lubricated regularly.

In general the **front wheel fork** does not require any particular lubrication; any oil that may have spilled out must be supplemented from time to time. Only when any repairs are necessary, the oil must be drained off, and after the inlet plugs (figs. 1 and 2) arranged at the upper ends of the fork prongs have been screwed off **about $^1/_4$ pt. of shock absorber oil** must be filled again into each prong. The inlet plugs serve at the same time for **ventilation and they are filled with copper-wool** to keep out any dust; they must be cleaned from time to time in the same way as the air filters on the carburetters.

During the running-in period frequent change of oil for the engine is emphatically recommended. **The oil must be drained completely from the crankcase every 300 miles,** the oil filter 17 (fig. 13) must be taken out by unscrewing the six nuts 18 and removing the cover 19, and the casing must be rinsed with rinsing oil. The oil filter must by no means be cleaned with petrol or kerosine.

After mounting the oil filter replenish fresh oil exclusively through a screen. Check the oil level in the engine every 250 miles and replenish up to the upper ring mark on the dipstick. **After the running-in period drain and renew the oil every 1200 miles** (figs. 1 and 2). After 7500—10000 miles the oil filter becomes ineffective and must then be renewed.

The oil in the gearing and the rear axle casing must be drained completely after the runing-in period and replaced by fresh oil. Check the oil level every 600 miles and replenish up to the lower threads of the oil inlet (fig. 1). Apart from renewing the oil after the running-in period, it must be drained approximately **every 10 000 miles** and replaced by fresh oil.

We recommend having the oil for gearbox and rear wheel drive casing changed by one of our appointed agents.

To **check the oil level in the rear wheel drive casing** the lower part of which constitutes at the same time the oil tank, there is on the left side of the housing a dipstick 29 (fig. 20) provided with hexagon head. When filling in, the oil must reach up to the upper ring mark on the dipstick, and care must be taken that in no case more oil is filled in, and furthermore, that the oil level does not sink below the lower ring mark of the stick.

Regarding the lubricants to be used see chapter „Lubricants and Fuels“, page 12.

To clean or check the oil pump the oil must be drained from the crankcase by removing the screw plug arranged below the casing, before the oil pump is removed. Now unscrew the four nuts 28 from the stud-bolts of the oil pump cover, and then pull out the latter with the pump downwards. After reassembling the pump convince yourself by checking with a little oil that the pump is replaced correctly, i. e., see whether ample oil is supplied when the driving wheel is turned. **When inserting new packings it is important to see that the bore to the ascension pipe (fig. 20) between oil pump cover and casing flange is not covered, as otherwise lubrication is obstructed.**

Supply the lighting and ignition magneto of the R 12 single-carburetter machine with the corresponding engine oil at least every 1200 miles. The oil must be replenished at the one flap lubricator, until it runs out at the other flap lubricator.

In the lighting and ignition battery of the R 12 and R 17 two-carburetter machines the grease in the reduction gear and in the ball bearings must be renewed on the occasion of a general overhaul of the motor cycle or approximately after every 12000 miles. The renewal of the lubricant (Ambroleum) in the reduction gear and of the hot-bearing grease (dripping point 350° F.) in the ball bearings had best be done by a Bosch representative or Bosch service depôt.

We recommend particularly having the motor cycle and engine overhauled at last once a year. At that opportunity also the thrust bearings of the front wheel fork should be supplied with fresh grease.

3. Cleaning.

When hosing down the machine, care should be taken that the jet of water is not directed on the engine, gearbox and rear wheel drive so that no water enters there.

It is essential that no water should be squirted on the lighting and ignition magneto or lighting and ignition battery under any circumstances: particularly it must not enter the distributor and the contact breaker casing. For this reason all parts of the ignition and lighting plant, but particularly the lighting and ignition battery or the lighting and ignition magneto must be covered carefully, before hosing down the motor cycle.

4. Supervision of the brakes and clutch.

A **regular supervision** of the brakes is imperative for safe driving so as to be able to rely in every case on their faultless working.

Fig. 7 Front wheel brake

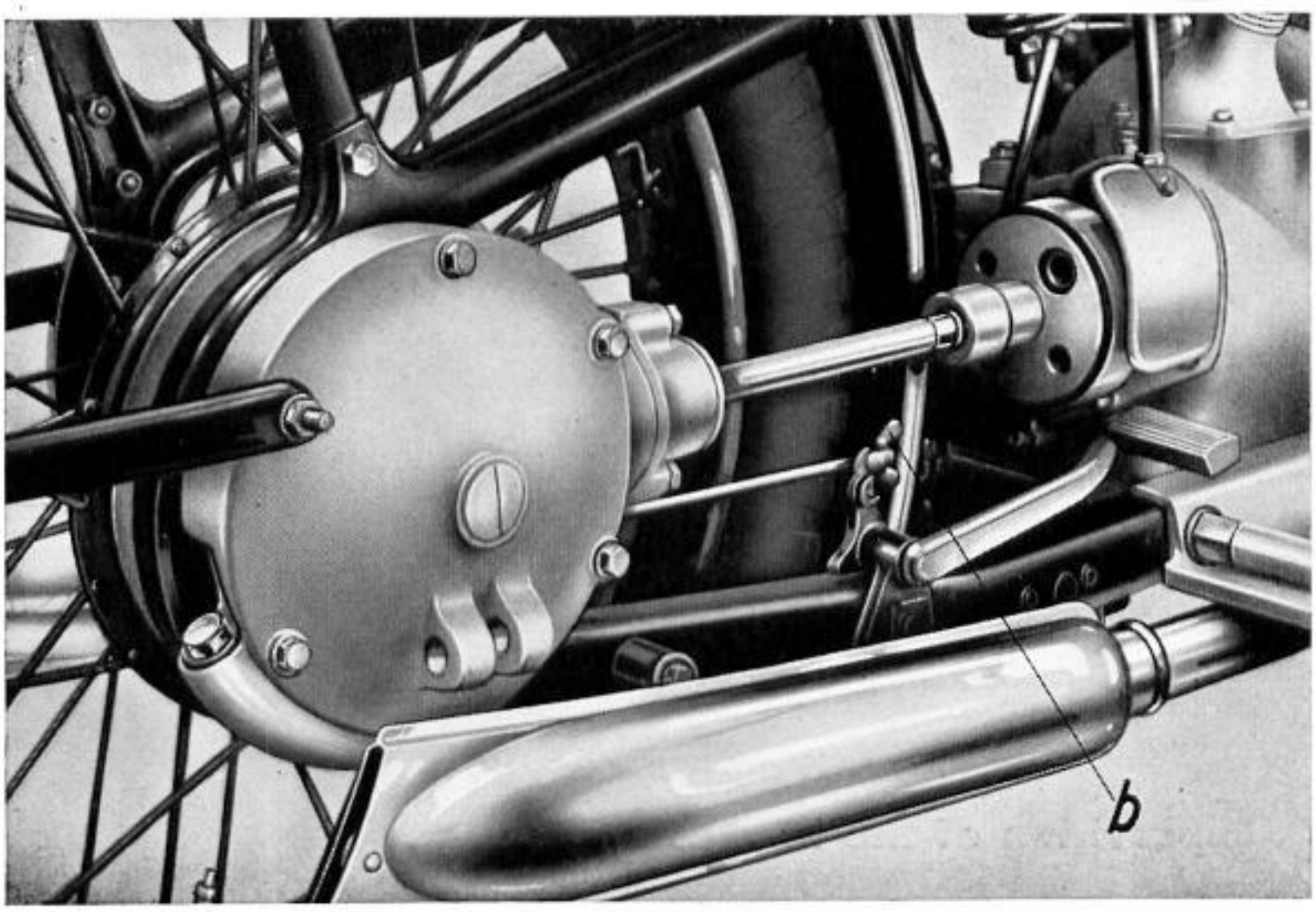


Fig. 8 Rear wheel brake

The adjustment is effected with the **front wheel brake** by unscrewing the wing screw arranged in the middle of the brake case, in which the Bowden wire ends, a few turns. (See fig. 7.)

The adjustment of the **rear wheel brake** is effected in the simplest manner by tightening the wing nut b, located on the brake tension rod. (See fig. 8.)

Wenn adjusting the brakes it is advisable to check also the clutch wire, and, if needful, to adjust it by means of the wing-nut located on the declutching lever.

When adjusting the brake and the clutch, great care should be taken that there is some play between the point of attack and the neutral position of the operating levers, as otherwise the lining of the brake or the clutch is subjected to excessive wear.

5. Maintenance of the electric equipment.

a) Contact breaker points of the R 12 and R 17 two-carburetter machines (lighting and ignition battery).

The contact breaker points should be readjusted regularly after about every 3000 miles.

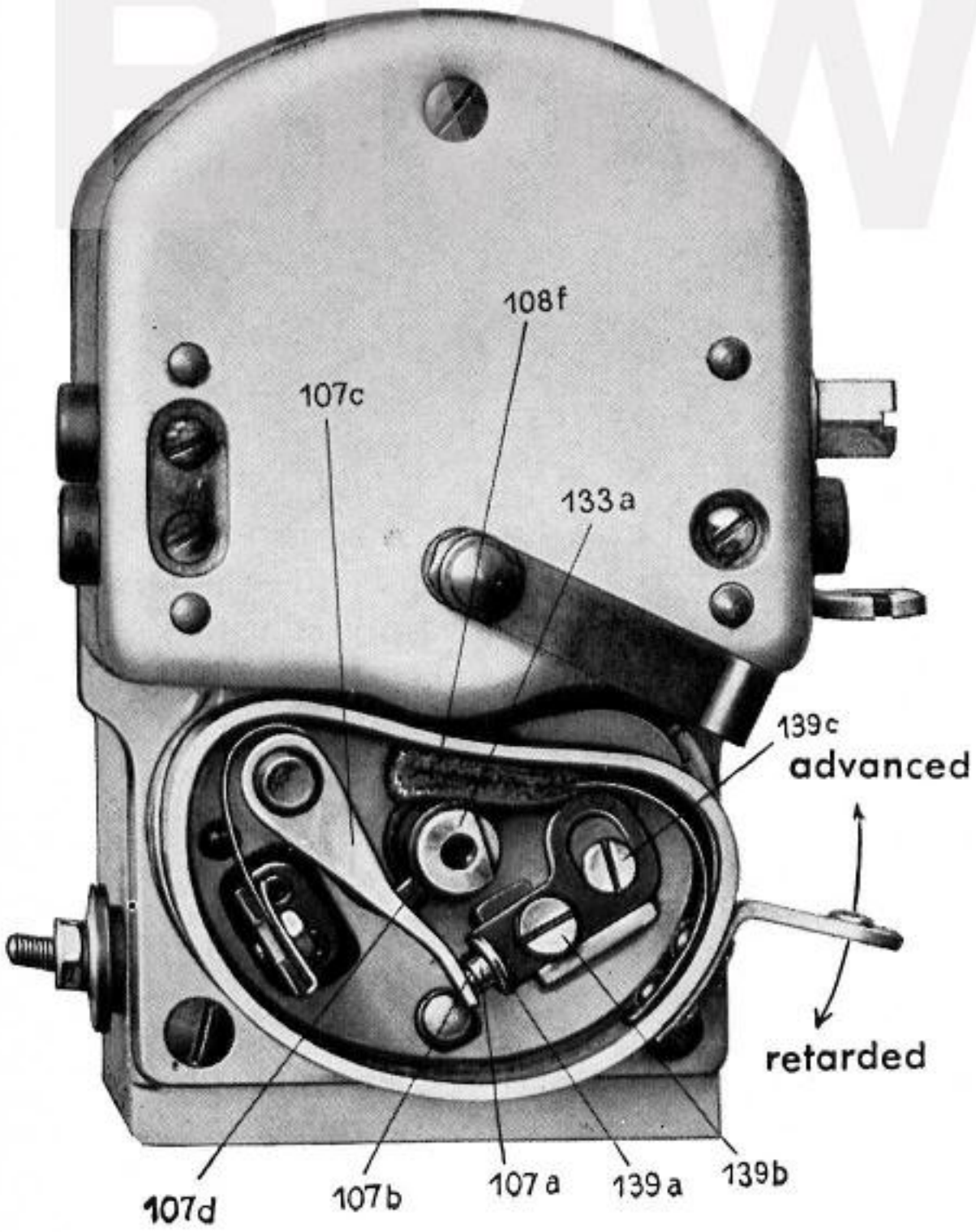


Fig. 9
Contact breaker of the lighting and ignition battery

During the interruption, i. e., when the insulating piece 107 d (fig. 9) of the contact breaker lever 107 c runs against the steel cam 135 a, the points 107 a and 107 b of the contact breaker must be 0,016—0,02 ins. (0.4—0.5 mm) apart. This distance can be adjusted by regulating the contact part 139 a. For this purpose the fixing screw 139 b holding the contact part is unscrewed and the proper distance is adjusted by means of the eccentric screw 139 c. Then the fixing screw 139 b is again made tight. If this is omitted, ignition troubles are the consequence.

If the contacts are very dirty, they must be cleaned with a clean rag.

By lifting off the contact breaker lever 107 c with the finger, the points 107 a and 107 b are separated from one another and can be cleaned easily. When adjusting the contacts, the lubricating felt 108 f should be soaked with a few drops of some good oil. (Fig. 9.)

Great care must be taken to see that no oil gets to the contact breakers, as oil is a non-conductor and the ignition would be caused to work irregularly thereby.

A slight colouring of the contact surface (gray or black) has no influence on the igniting action.

Emery paper or emery cloth must not be used to clean the contacts.

If the points are burned badly or worn out completely, they must be renewed by some Bosch agent or Bosch service depot.

b) Contact breakers with the R 12 single-carburetter machine (lighting and ignition magneto).

Adjust the contact breakers regularly after approximately every 3000 miles.

During the interruption, that is when the fibre piece 107 d (fig. 10) of the interruptor lever 107 c runs against the steel cam 108 a of the cam-ring 108, the points 107 a and 107 b of the contact breaker must be 0,012—0,016 ins. (0.3 — 0.4 mm) apart. This distance may be regulated by adjusting the contact screw 107 a. (For this purpose unscrew lock nut 107 g and screw tight again after adjustment.)

The distance of the contacts should be checked with the gauge riveted to the small Bosch magneto key.

If the contacts are very dirty, they must be cleaned with a clean rag.

Emery paper or emery cloth must not be used to clean the contacts.

If the contacts of the contact breakers are burned badly or worn out completely, they must be renewed by some Bosch agent or Bosch service depot.

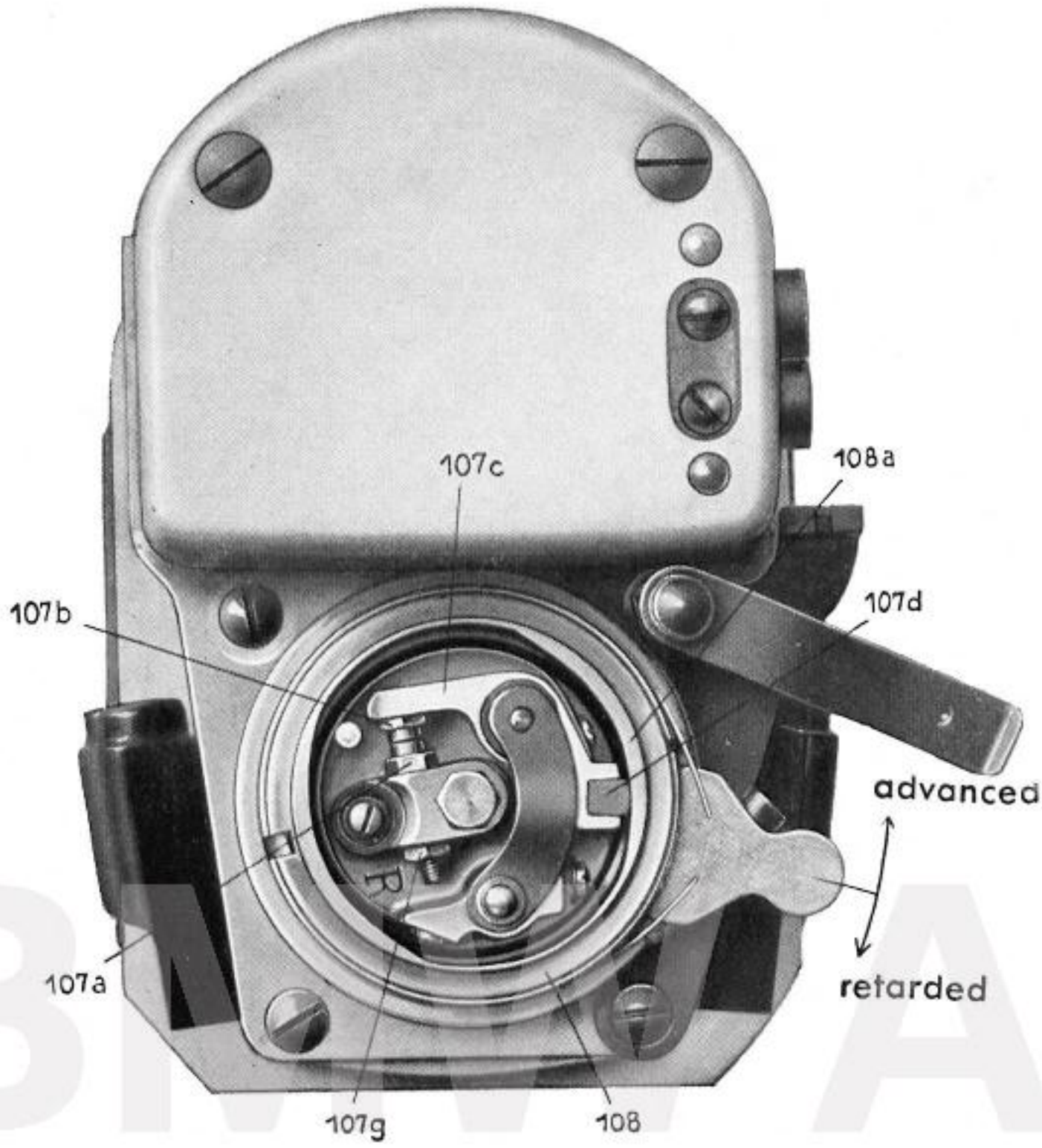


Fig. 10 Contact breaker of the lighting and ignition magneto

c) Sparking plugs.

Only the prescribed, approved sparking plugs should be used which do not produce glow ignition even when highly stressed:

for the R 12 machine: Bosch sparking plug D M 175/1
for the R 17 machine: Bosch sparking plug D M 200 G 24.

d) Service instructions for the battery.

The battery must be checked regularly every 4—6 weeks, whether the motor cycle is used or not; particularly with the two-carburetter machines the readiness of the motor cycle for service depends on a careful maintenance of the battery.

The charging and treatment of the charged battery may be seen from the Bosch instructions.

e) Cables.

Check regularly after about every 2000 miles whether the cables are worn through at any place; special attention should be paid to the cables on the handlebars and to the battery cable. Damaged cables should be replaced immediately by new ones.

For the rest we refer to the Bosch instructions supplied with the motor cycle regarding the maintenance of the entire electric equipment.

6. Treatment of the carburetters.

a) R 12 single-carburetter machine: To maintain the performance, it is necessary to clean the carburetter from time to time. Particularly in the beginning the fuel screen in the float chamber cover, the jets, the float-chamber itself, and the carburetter valve needle must be cleaned repeatedly.

To clean the jets it is only necessary to unscrew the nut 4 (fig. 14) by which the carburetter case is fastened to the float chamber, whereupon the float chamber with the jets may be removed downwards. By means of the key supplied with the tools the jets may be unscrewed and cleaned. When screwing them back again, the proper sequence must be observed. The numbers of the jets are stamped on their squared parts as well as on the joint of the float chamber.

b) R 12 and R 17 two-carburetter machines: The cables of the gas slide valves of both carburetters run into a collective slide valve casing where they connect to one slide piece. **One** Bowden wire leads on from this, so that by operation of the throttle twist grip both the respective slide valves in the two carburetters are opened or closed simultaneously.

These cables can be evenly adjusted to minimum play by a Bowden nipple arranged on each slide valve casing.

The carburetters should be dismantled from time to time and the separate parts washed in clean petrol. If the jet piece should stick fast when dismantling, it must be pressed out by means of a piece of wood. When re-assembling avoid using force.

In case the bores of the jets should be clogged, they must be cleaned by blowing out or by means of horse-hair only; **no pointed tool** (pin etc.) **must on any account be used for it, as the sizes of the jets would be changed thereby.**

c) Float chamber: The float chamber must be cleaned with petrol after about every 2000 — 2500 miles. At the same time the needle valve should be checked. For this pupose the cover of the floatchamber must be taken off. With the carburetters of the **R 12 two-carburetter machine** the clamping screw X (fig. 15) must be unscrewed first to be able to screw off the cover. Then the clamp spring V on the carburetter valve needle U

must be removed whereupon after removal of the connecting piece of the petrol piping at the bottom, the float chamber may be taken out downwards. (Fig. 15.)

At the same time the fuel filter inserted in the cover of the float chamber of the carburetter of the **R 12 single carburetter machine** and those in the petrol piping connecting piece at the bottom of the float chamber of the **R 12 two-carburetter machine** must be cleaned (fig. 14 and 15). Also the fuel pipes from the fuel tank to the float chamber or chambers and the fuel cock must be checked regarding sufficient flow. At this opportunity remove from the fuel cock also the container serving as a water trap and clean it together with the fuel filter which it contains.

The air filters screwed on to the carburetters must likewise be rinsed from time to time with petrol, then immersed in warmed oil, and the superfluous oil carefully and thoroughly ejected.

7. Adjustment of the valve clearance.

Also the valve clearance between the valve stem 36, and the tappet screw 35 or the thrust screw 3 (figs. 11, 12 and 20) which should amount to about 0,004" (0.1 mm) with the **cold** engine, must be checked from time to time. For this purpose it is best to use a narrow strip of note paper which corresponds approximately to the clearance. The adjustment of the valve clearance of both machines is described below; as said before, it must not be done except with the **cold engine.**

Touring machine: First the cover 31 to the valve chamber is taken off by unscrewing the head screw 32 connected with same (figs. 11 and 20). Before adjusting convince yourself that the tappet 33 seats on the circular

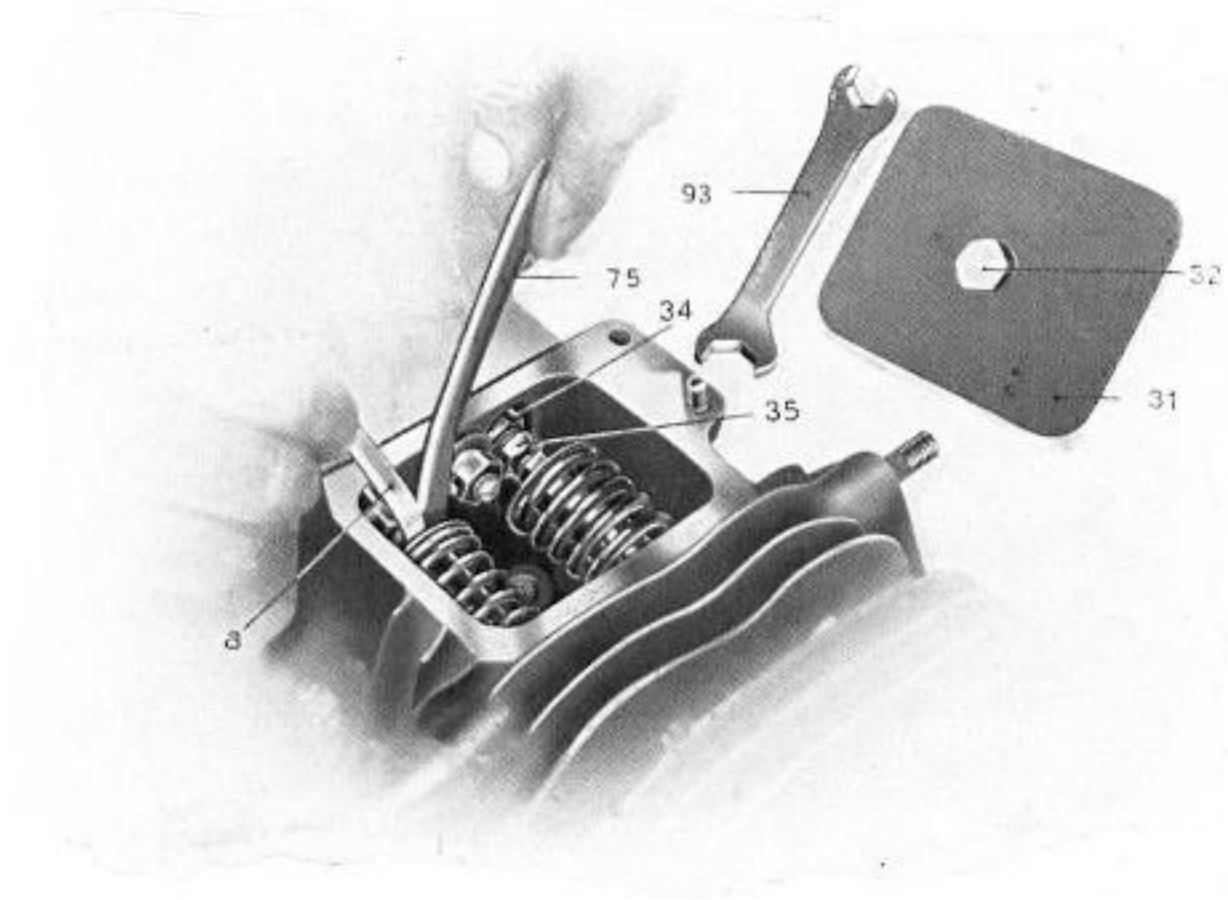


Fig. 11 Adjustment of the valve clearance of the touring machine

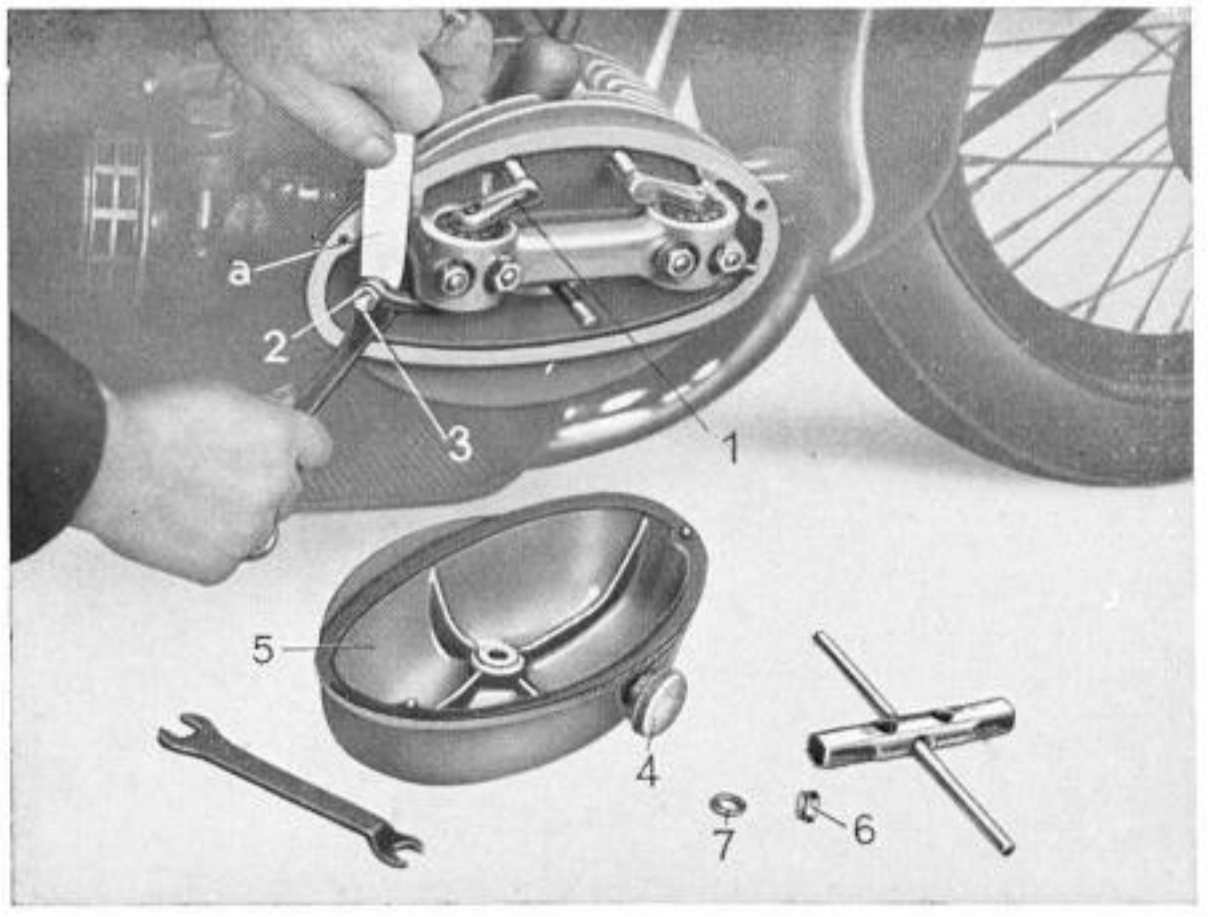


Fig. 12 Adjustment of the valve clearance of the sports machine

part of the cam and that it does not by any chance touch the ascending or descending cam curve, which is easily determined by turning the crankshaft slightly forwards or backwards by means of the kickstarter. In doing so the tappet 33 must neither rise nor sink. The tappet is held firmly in position by means of the key 75 supplied with the tools and the lock nut 34 located on the tappet is unscrewed with the second key 93. Now screw 35 on the tappet can be adjusted in such a way that the paper strip A can be introduced between valve stem and tappet screw 35 without difficulty. If the adjustment is correct, the lock nut 34 is tightened again, whilst the tappet screw 35 is held fast with the key 93. After this the valve chamber must be closed again by the cover 31 (fig. 11).

Sports machine: After loosening and removing the nut 6 and the disc 7 the protective cap 5 is removed (fig. 12). Now turn the engine by means of the kickstarter in such a way that the rocking lever 1 may be moved as far as it will go. Then loosen the lock nut 2, adjust the thrust screw 3 with the paper strip a, to the proper distance and then tighten the lock nut 2 again. After replacing and screwing on the protective cap fill in a small quantity of oil — about one tablespoonful — which may be done after removing the screw plug 4. This oil serves to lubricate the valve action, and should be checked and, if needful, replenished every 1000 miles.

8. Tyre pressure.

With the unloaded machine the tyres should show only a slight depression. The prescribed air-pressure should amount with solo-machines to 15 lbs/sq. in. in the front tyre, to 21 lbs/sq. in. in the rear tyre, and with machines with sidecars to 18 lbs/sq. in. in the front wheel tyres and 24 lbs/sq. in. in the rear wheel tyre.

III. Description.

A. Engine and gearbox unit.

1. Crankshaft and pistons.

The crankshaft consisting of steel with hardened crank pins runs with the **R 12 model** in ball bearings, and with the **R 17 model** in roller bearings. The bores in the pins serve in connection with corresponding oil channels to amply lubricate all bearings.

The **light alloy pistons** used for both types of construction are supplied with 3 piston rings the lowest of which is used as an oil scraper. The hardened and ground gudgeon pin is carried in bearings in the piston head and secured by spring rings.

2. Valves.

a) Valves of the R 12 model (fig. 20). The valves are completely enclosed, located at the side of the cylinder and are operated from the camshaft 1 by enclosed tappets 33. Any oil that might leak out at the tappets is conducted back into the casing through a return flow bore, so that any escape of oil outside the engine is made impossible. Through a detachable protective cover the ends of the valve stem and the tappets are easily accessible for the purpose of adjustment of the valve clearance.

b) Valves of the R 17 model: The overhead valves are operated from the camshaft by enclosed push rods by means of rockers on roller bearings with thrust screws. Any escape of oil is prevented here by the protective tubes of the push rods in which the oil can flow off into the protective cap of the cylinder head where it serves to lubricate the valve action. The easily detachable protective cap enables in a simple manner the adjustment of the clearance between the thrust screw and the end of the valve stem (see page 22).

3. Steering.

The camshaft 1 (fig. 13) supported in plain bearings 2 and 3 above the crankshaft is driven from the latter by the sprockets 4 and 5 which are connected by a silent roller chain. The camshaft also drives through sprockets 6 and 7 the magneto for lighting and ignition by means of a silent chain.

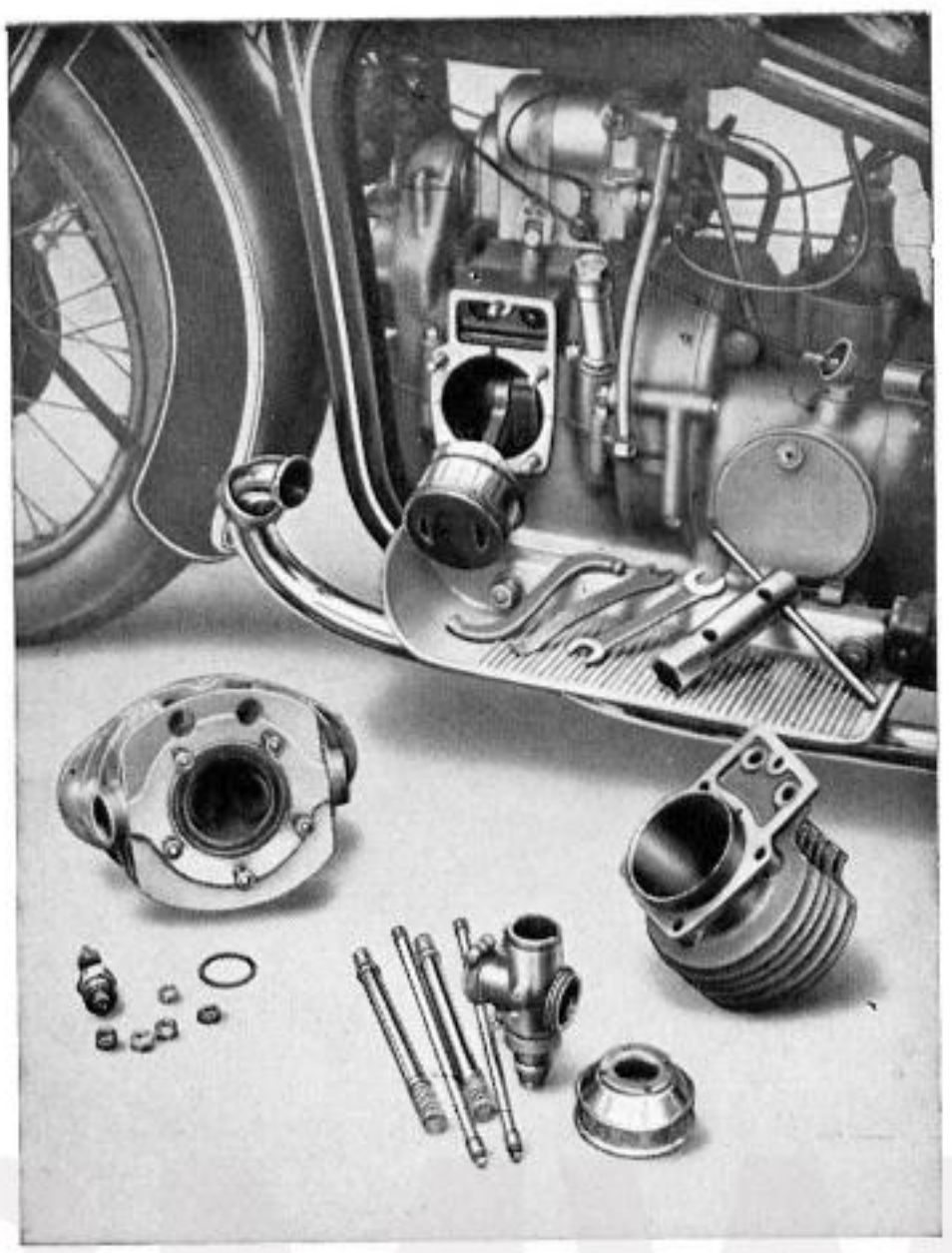


Fig. 13
Longitudinal section through engine and gearbox

4. Air breather.

The air breather of the crankcase consists of a rotary slide valve 8 connected by set studs with the sprocket wheel 6 keyed on to the steering wheel 1, the rotary slide valve being supported by the cover 9 of the transmission casing (fig. 13). The air which is compressed in the crankcase on the down stroke of the pistons escapes through the rotary slide valve 8, the cover 9, and through a connection 10 to a piping 11 located outside which conveys the air to the open. In this manner a slight back pressure is always produced in the crankcase which effectively prevents any escape of oil at the joints of the casing.

5. Lubrication and oil control.

A rotary geared pump (fig. 20) built in the lower part of the crankcase sucks the oil through a filter 22 by the action of the two gear wheels 23 and 24, the latter of which is driven by means of a shaft 25 and worm wheel 26 by the worm on the camshaft 1.

The oil is pressed into the rising pipe 20 through a bore in the cover 27, and enters the oil distribution pipe 12 (figs. 13 and 20) and from there through the vertical oil pipes 13 and the finely bored oil jets 14 to the bushes 15 and 16 (fig. 13) to lubricate the crankshaft roller bearings. Part of the oil enters the distributing grooves of the bushes, from where it is then con-

pucted to the connecting rod bearings through the hollow bored crankshaft pins and webs. The front vertical oil pipe 13 provides for the lubrication of the chain wheel 4 on the crankshaft, also the two chain wheels 5 and 6 on the steering wheel, the drive of the magneto with the chainwheel 7 carried on its shaft, as well as the front camshaft bearing 2 are amply lubricated. The lubrication of the rear camshaft bearing 3 is ensured in a sufficient manner by the sprayed oil from the crankshaft.

Part of the oil is conducted by the oil pump into the oil filter 17 through rising pipe 20 (fig. 20), oil distributing pipe 12, and oil jet 21 (fig. 13) and leaves it completely purified to be conducted back to the oil pump through the oil well.

The oil flowing back from the driving mechanism into the oil well is also purified by an oil filter fitted in the lower part of the casing before entering the oil well.

6. Carburetters.

a) R 12 single carburetter machine. For the R 12 „Single carburetter" Touring machine a „Sum" carburetter with three fuel jets is employed. The suction piping is heated by exhaust gas, so that a perfect mixture is formed even in cold weather.

In fig. 14 the carburetter is shown with the float chamber in section.

The carburetter casing 1 rests on a flange cast on the float chamber 3 and is connected with it by means of stud bolt 3 and nut 4. In the extension piece of the float chamber there are three jets screwed in, two of which 5 and 6 extend into the middle of the suction pipe of the carburetter box and are separated from one another by a vertical metal partition, whilst the third, the idling jet 8, ends in a side channel of the carburetter casing. The gas slide valve 9 is arranged in the carburetter casing vertical to the suction pipe and connected by Bowden wire with the right twist grip. A pressure spring 10 holds the slide valve always in closed position and blocks the suction channel. The final position of the slide valve for idling can be regulated by means of an adjusting screw 11. To regulate the composition of the mixture for idling an adjusting screw 12 is arranged above the idling jet and on the same axis, this adjusting screw regulating the flow of air passing over the idling, jet. By screwing in this adjusting screw the flow of air is throttled, so that the mixture becomes richer in fuel, and by unscrewing the opposite effect is produced.

The float 13 with needle 14 is housed in the float chamber 2 and regulates the fuel level by the action of the needle valve 15. A fuel filter 16 in the stop screw 17 of the cover 18 retains the impurities of the fuel entering the connecting piece 19 from the fuel tank. The fuel enters the three jets 5, 6 and 8 through a bore in the cast-on flange of the float chamber. These jets are supplied with a fine bore below the fuel level approximately on a level with their squared parts and adjusted in exact relation to each other.

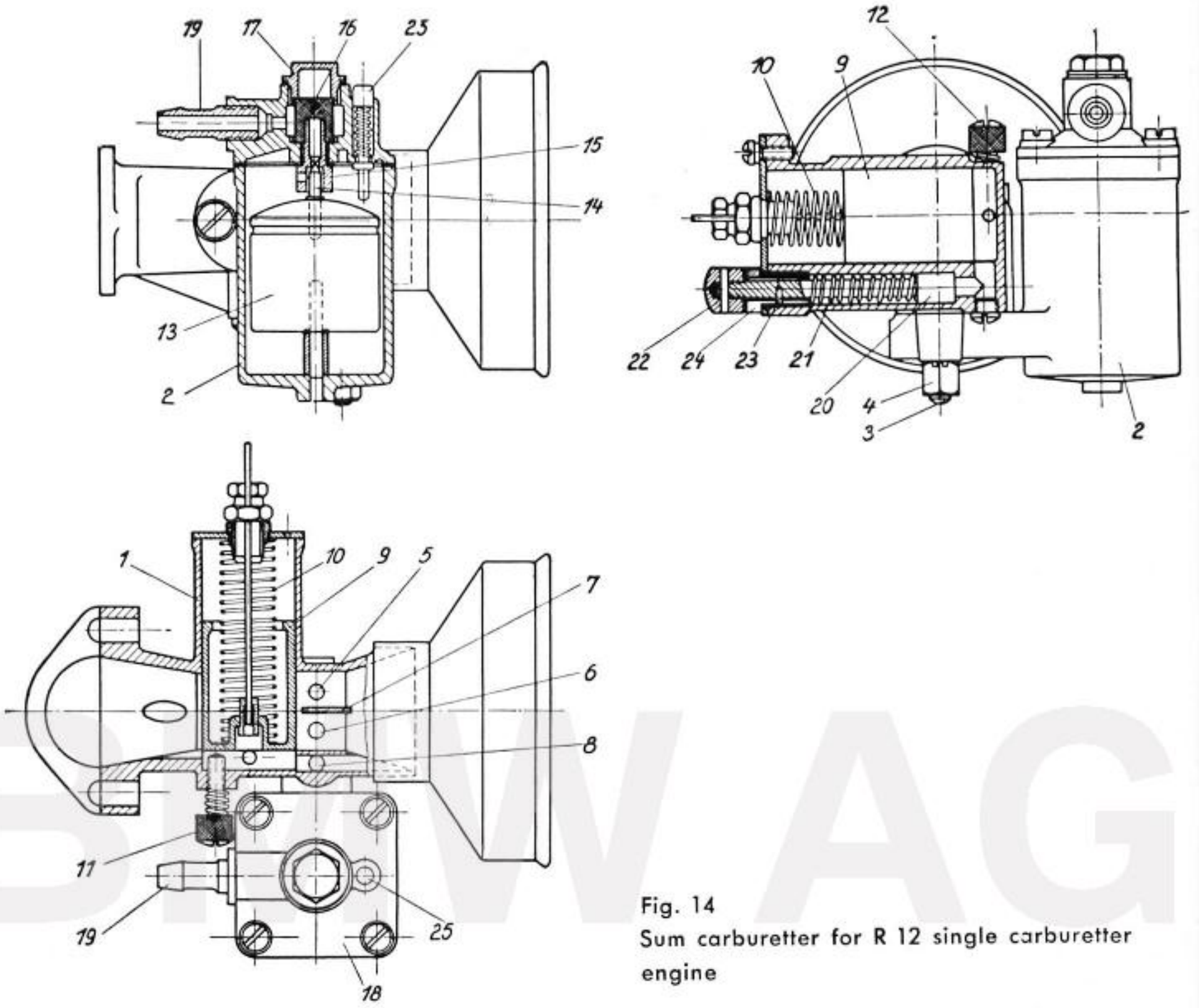


Fig. 14
Sum carburetter for R 12 single carburetter engine

So as to facilitate starting the engine, a starting piston 20 is fitted inside the carburetter casing 1 below the gas slide valve 9 and held in closed position by a spring 21. Before starting the cold engine, the starting piston 20 by means of the operating button 22 must be pulled outwards in opposition to the pressure of spring 21 and then turned to the right whereby the stop 23 extending into a guiding slit of sleeve 24 presses against the flange of sleeve 24 and keeps the starting piston open. This enlarges the suction cross section for the idling jet and a strong current of air is conducted over the idling jet with the result that a mixture rich in fuel is supplied to the engine. After the engine has warmed up, the starting piston must be closed by turning it further. Thus the stop 23 returns into the guide of the sleeve 24 and the piston 20 is pressed down into its final position by spring 21.

In cover 18 of the float chamber 2 a tickler 25 is arranged which acts on the float 13 when pressed down, whereby the supply of fuel to the float chamber is liberated, and the due supply of fuel may be checked (fig. 14).

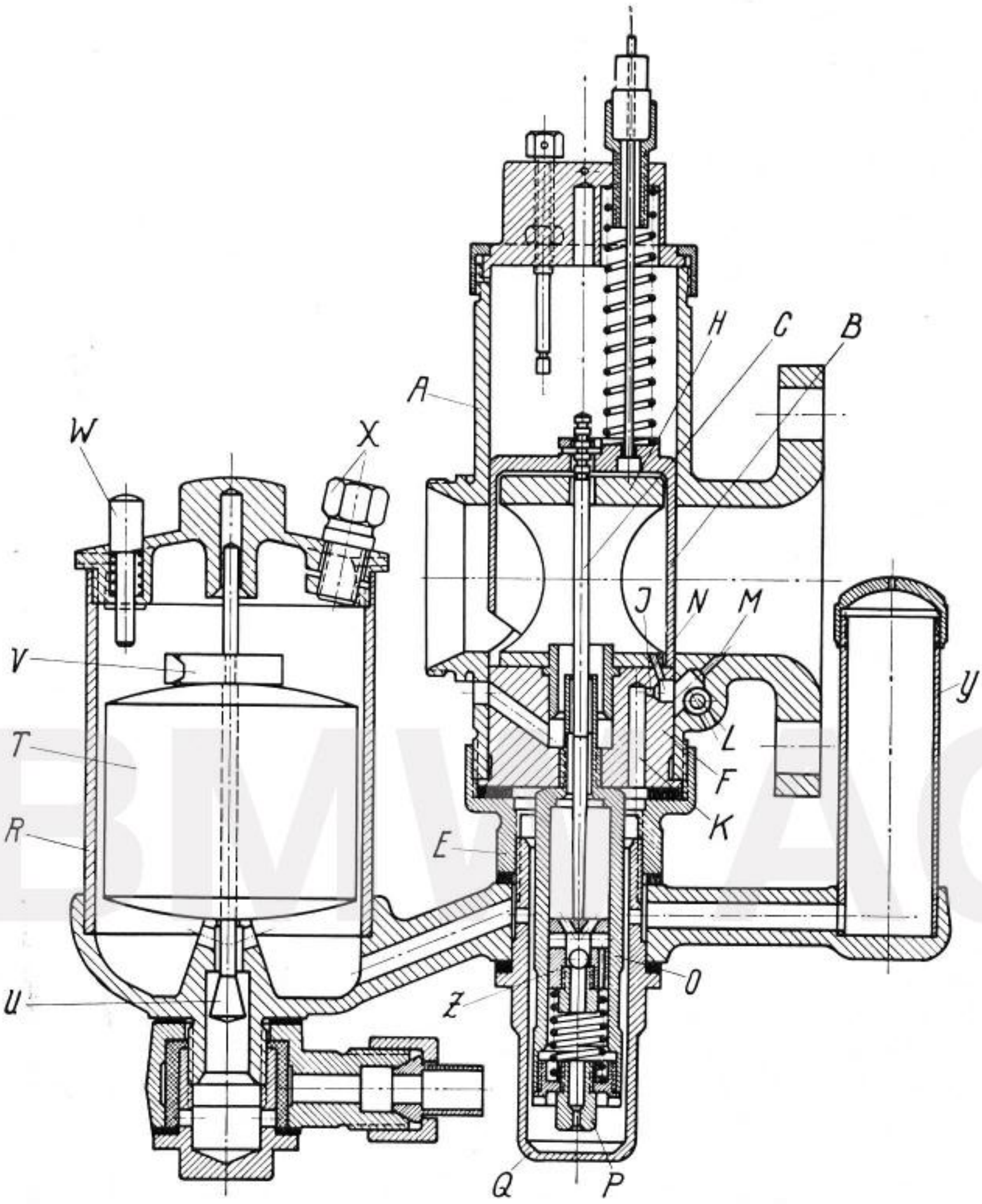


Fig. 15 Carburetter of the two-carburetter touring machine

b) R 12 two-carburetter maschine. For the R 12 two carburetter touring machine two Amal single slide valve pump carburetters are employed the inner structure of which is shown by fig. 15.

The carburetter consists substantially of the slide valve casing A, in which the inverted cup-shaped throttle slide valve B is guided; the jet body F, into which the main jet insertion O, designed as a pump cylinder with the main jet P inserted therein, is screwed and in which a fine bore I is provided as an idling jet; and the float chamber R with the compensation vessel Y lying opposite to it.

The supply of fuel through the main jet P or the main jet insertion O is controlled by a jet needle C which is tapered in its lower part and suspended in the bottom of the slide valve by means of a small clamp spring seated in a notch of the needle, said needle extending into the main jet insertion O.

When the throttle slide valve is opened only a little, the annular cross section remaining in the needle jet between the jet needle and the main jet insertion O is small, the back pressure acting on the main jet is low and the supply of the fuel through the main jet is likewise low. When the throttle slide valve is opened further this annular cross section is enlarged owing to the tapering, and the supply of fuel is consequently increased. By higher or lower suspension of the needle in the bottom of the slide valve and by placing the fixing spring into higher or lower situated notches of the needle, a possibility is offered for regulating the composition of the mixture.

With the slide valve closed, the jet needle C presses the accelerating piston Z inserted in the main jet insertion O and provided with a return valve, downwards against the pressure of a spring. When the throttle slide-valve is opened suddenly, the spring presses the piston quickly upwards, whereby the fuel present in the pump chamber is squirted into the mixing chamber through the needle jet of the main jet insertion O.

The fuel flowing into the float chamber R, the flow of which is regulated by the needle valve U operated by the float T, enters the bores of the cap nut Q connecting chamber R with casing A through the bore of the arm of the float chamber, whereupon the needle jet and bore K in the jet body F are filled with fuel. When the throttle slide valve is opened but little, air is sucked through the idling air hole L and fuel through the idling jet 3 owing to the back pressure caused by the sucking action of the engine, and the mixture of air and fuel produced in this manner is conducted to the engine through the idle running outlet M.

The further the throttle slide valve B is opened, the less is the sucking action at the outlet M, but a higher sucking action is achieved at the transition jet N, and the idling mixture flows through this bore as well as through the outlet M.

The compensation vessel Y attached to an extension of the arm of the float chamber has the task of providing always a sufficient supply of fuel to the jets. In taking curves, particularly when side cars are used, it was proved that the fuel is pressed against the part of the wall of the float chamber lying at the outer side of the curve, and that it is withdrawn in this manner from the jets. This drawback is avoided by the compensation vessel Y, as in such a case the fuel contained in this vessel flows into the jets.

c) R 17 two-carburetter machine. For the sports machine R 17 two Amal single carburetters are likewise employed which differ from the

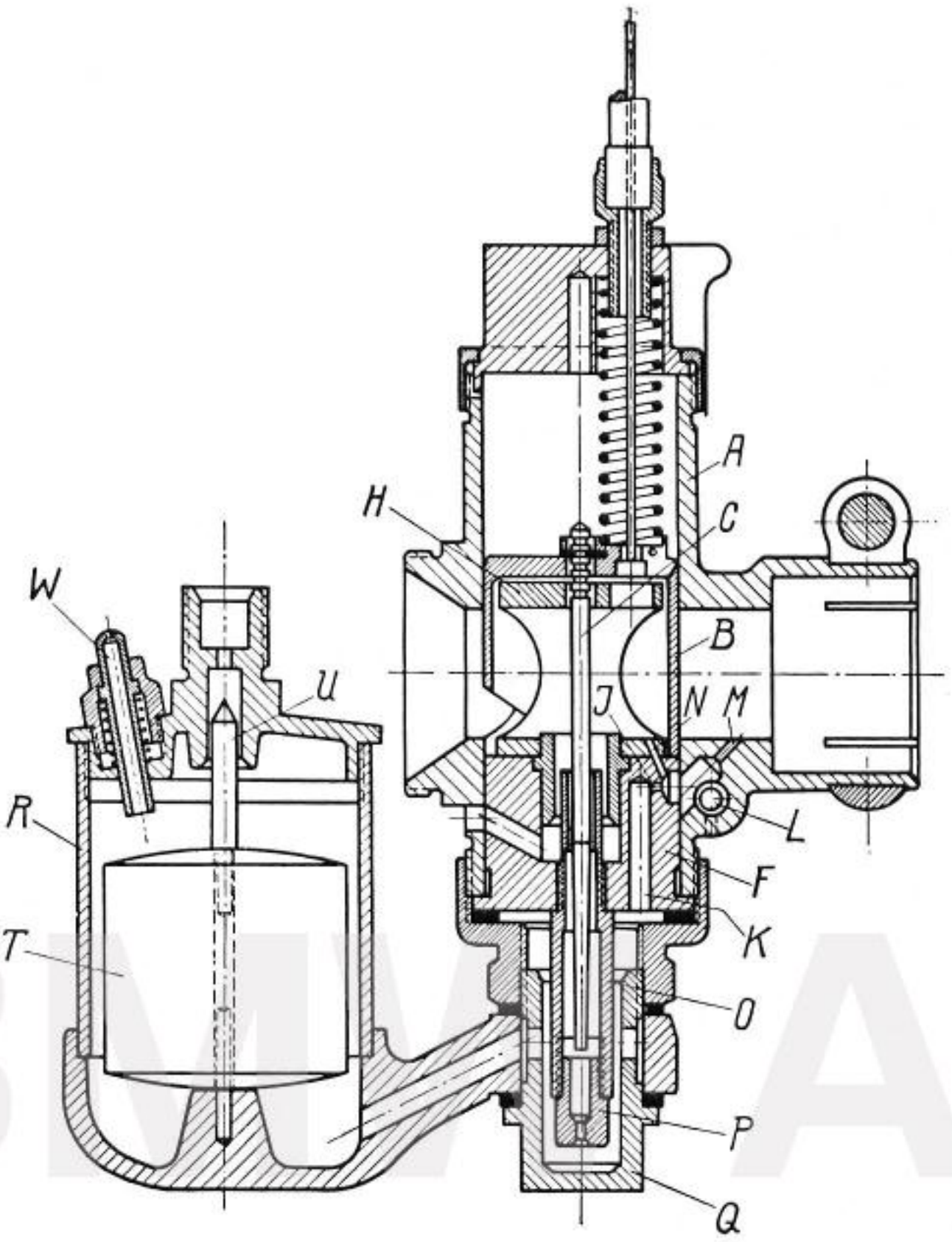


Fig. 16 Carburetter of the sports machine

carburetters of the R 12 machine only in so far as there is no acceleration pump nor any compensation vessel provided. The fuel supply is situated above the float chamber.

With the carburetters of the **R 12 and R 17 two-carburetter machine** a tickler **W is arranged** in the cover of the float chamber which on pressing down keeps the float valve U open and thus shows whether there is a proper flow. When kickstarting the engine, more fuel is supplied to the jets by operating the tickler W which considerably facilitates starting (fig. 15 and 16). Regarding the maintenance of the carburetters see page 20.

7. Ignition.

a) R 12 single-carburetter machine. For the ignition of the mixture a lighting and ignition magneto is provided which supplies the ignition current and the light current separately. The contact breaker and the parts

required for the distribution of the high-tension current are likewise included in the lighting and ignition unit. The battery included in the ignition lighting plant serves only for supplying current when the motor cycle is at a standstill. Thanks to a quick-regulator mounted in the dynamo, it may be operated even with disconnected battery.

Regarding the maintenance of the entire lighting and ignition installation we draw particular attention to the Bosch instructions supplied with the machine.

The **adjustment of the timing** is effected by the twist grip arranged at the left of the handlebar (fig. 5).

b) R 12 and R 17 two-carburetter maschines. The ignition installation of the two-carburetter machines consists of a **lighting and battery magneto** driven by the engine to which the contact breaker and the distributor are connected; of the battery, and the ignition coil.

The low-tension current supplied by the battery which is charged by the lighting and battery magneto is interrupted by the contact breaker at the moment of ignition. A high-tension current is created thereby which is conducted from the ignition coil through a carbon brush arranged in the distributor cover which constitutes at the same time the cover of the contact breaker to a distributor fastened on the cam of the interruptor. This distributor running with its distributor electrode over two contacts in the distributor cover conducts the high-tension ignition current through these two contacts to the two spark plugs screwed into the cylinders.

If the battery is damaged the engine may also be started with the sole aid of the lighting generator and the plant may be continued to be driven by the latter only.

To this end the cable (wire 30) leading from the magneto to the battery must be disconnected and the switch on the protective case of the regulator must be moved to „dynamo". When starting the engine, all the consumers of current with the exception of the ignition coil must be cut out in such a case.

Before using the repaired and charged battery again the switch must be moved back to „battery" (see page 3, 4 and 21 of the „Bosch" Instructions).

Also regarding the maintenance of the entire ignition installation we draw particular attention to the „Bosch" Instructions supplied with the machine.

The **adjustment of the timing** is effected by the twist grip arranged at the left of the handlebar (fig. 6 and 7). If desired, a lighting and ignition magneto may be fitted instead of the lighting and ignition battery.

We emphatically recommend having the lighting and ignition battery or magneto dismantled for thorough examination by some Bosch service depot on the occasion of the yearly overhauling of the entire motor cycle.

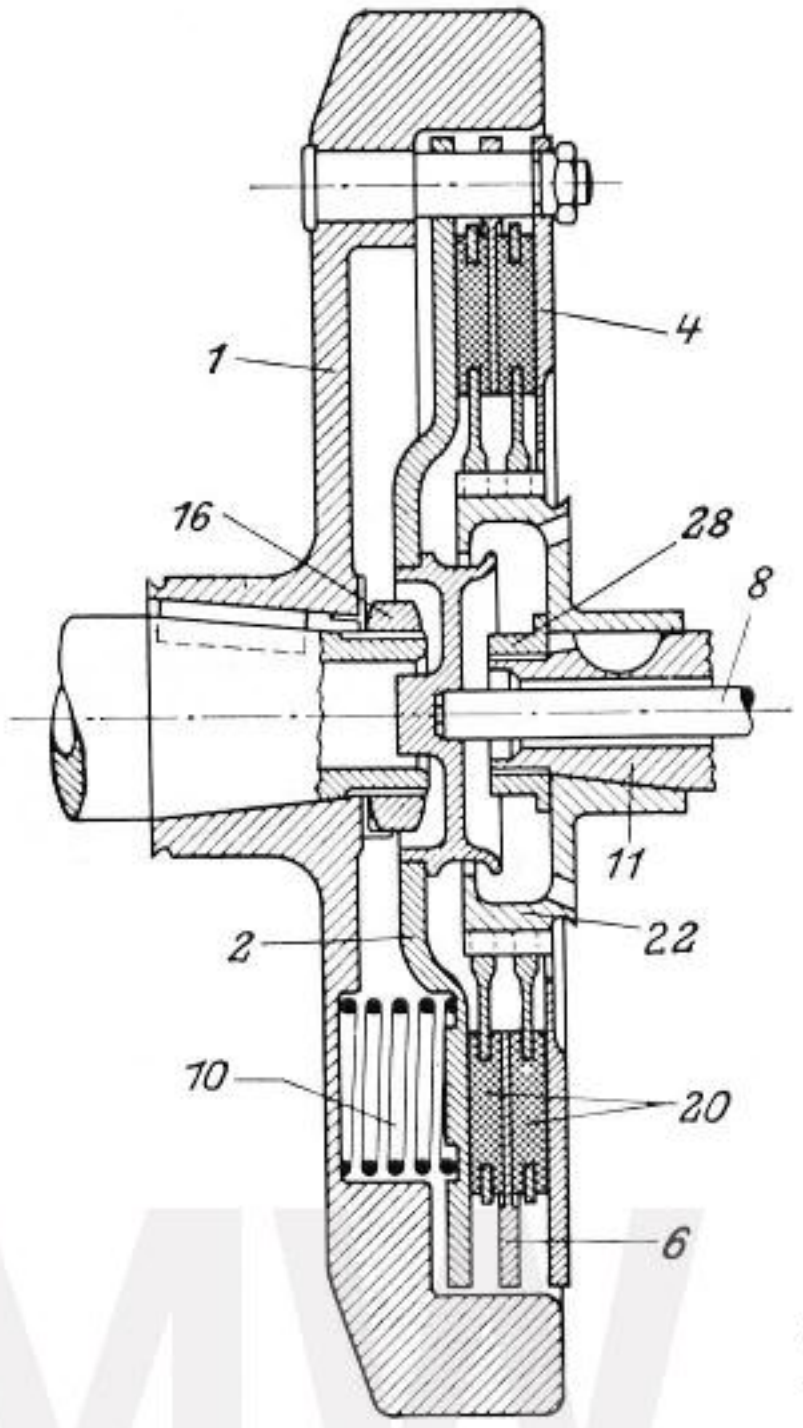


Fig. 17
Two-plate friction clutch

8. Clutch.

For clutching, a two-plate friction clutch is provided as shown in section in fig. 17. The driving part of this is the flywheel 1 seated on the tapered butt of the crankshaft 2 and secured by means of key and nut 16. Six clutch springs 10 arranged in recesses of the flywheel 1 and of the thrust plate 2 press the latter against clutch plates 20 provided on both sides with friction lining and against the rigid endplate 4, the clutch plates being separated by a driving intermediate disc 6. In this manner the clutch plates 20 seated on the boss 22 are taken along, and the rotating motion of the crankshaft is transmitted to the main shaft 11 of the gearbox.

The operating lever for the clutch is arranged at the end of the left twist grip (fig. 5) and acts on the clutch-lever at the end of the gearbox by means of Bowden wire. The declutching and thus the interruption of the transmission of power to the gearbox is effected by pulling the operating lever on the handlebar, whereby the thrust plate 2 is lifted off the clutch plates 20 by the thrust rod 8.

9. Gearbox and power transmission.

The torque produced by the engine is transmitted to the flywheel B by the crankshaft C; from there the clutch A, when engaged, passes on the

power to the gear main shaft D by which it is transmitted further through the respective pair of gear-wheels coupled with the change speed shaft P to the bevel gear Y and by splines further to the rear wheel. The method of action of the gearbox is shown diagrammatically by fig. 18.

The gears E, F and G, made in one piece with the main shaft D, and the gear H firmly keyed on to it are in constant engagement with the gears I, K, L and M, running loosely on the control shaft P. Owing to their different diameters these pairs of wheels rotate with different speeds. Between the wheels I, K, L and M there are the sleeves N and O which are connected by means of splines with the control shaft P, so as not to rotate, but free to slide along, and supplied with dogs on both sides.

When engaging the first or low gear (fig. 18b) the sleeve N is moved backwards by the gear lever Q and the selector N_1 and it engages with its dogs the recesses of wheel I, which is coupled hereby to the change speed shaft P. In second gear (fig. 18c) the sleeve N is moved forwards and its dogs are brought into engagement with the gear wheel K.

In 3rd and 4th gear (figs. 18d and e) the sleeve O is coupled by the selector O_1 by gear lever Q in the manner described above with gear wheel L or M, and thus four different speeds are communicated to the change speed shaft P. The change speed shaft P transmits the power through a flexible rubber coupling V to the cardan shaft W, and the latter transmits the power through a tooth-coupling X which takes up any longitudinal displacements that might occur, to the pair of bevel wheels Y by which the rear wheel is driven by splined joint. Both bevel wheels Y are helical toothed and run almost noiselessly.

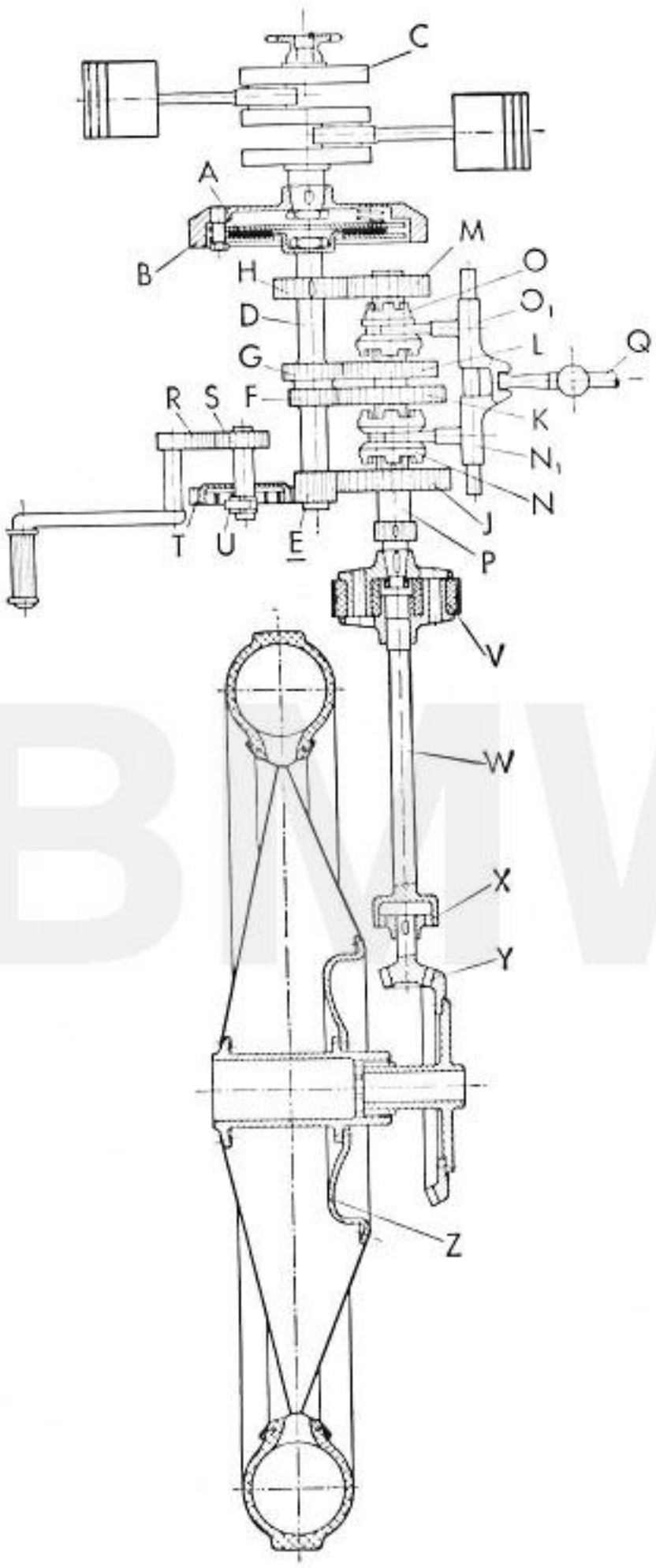
The thick arrow marked in fig. 18 shows the course of the transmission of power in the various speeds. In the neutral position (fig. 18) the sleeves N and O are out of engagement between the wheels I and K or L and M and the gear lever Q stands in the middle between the selectors N_1 and O_1.

The **engine** is **started** by the segment R operated by the kickstarter and the two spur wheels S and T. The spur wheel T is provided with internal teeth and is continuously in engagement with the wheel E on the main shaft. With the shaft to which a spur wheel S is keyed on the one end, a movable dog V is firmly connected on the other end. When the kickstarter is pressed down, the dog V transmits the rotating movement to the gear wheel T which transmits it in turn through the main shaft D and clutch A to the driving gear. When the kickstarter is in position of rest, the dog V liberates the internal teeth, and the wheel T rotates idle on its shaft.

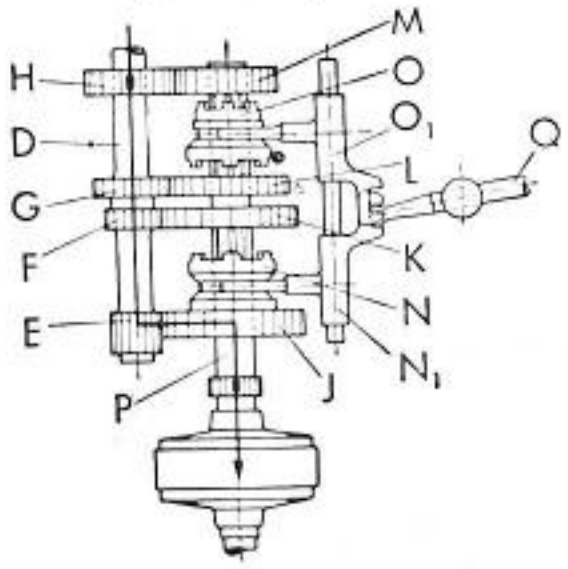
The brake drum for the internal expanding foot-brake is marked Z. On the change speed shaft P a worm wheel is keyed at the end in front of the flexible coupling, the worm wheel serving to drive the speedometer arranged in the head light.

Defects of the gearbox should be repaired exclusively by an appointed agent.

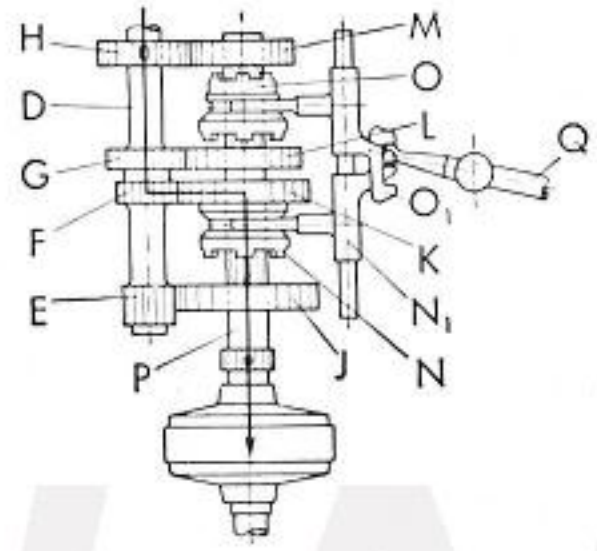
a) neutral



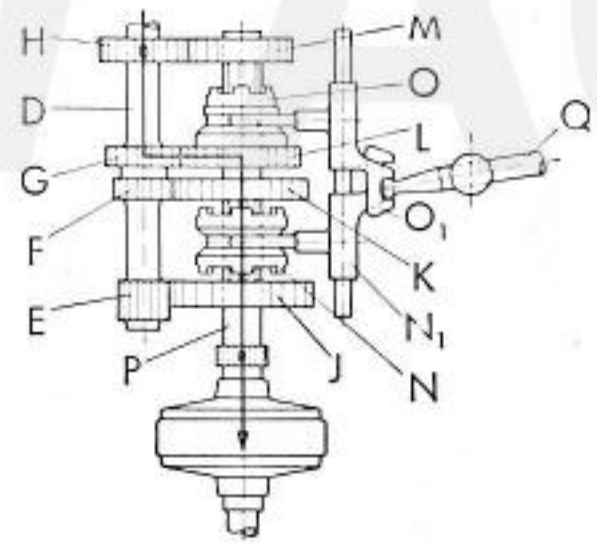
b) in 1st gear



c) in 2nd gear



d) in 3rd gear



e) in top gear

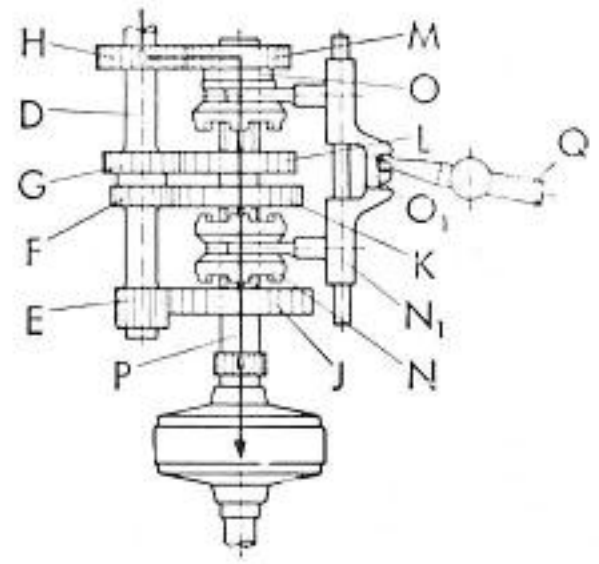


Fig. 18 Power transmission

B. Structure of frame and wheels.

1. Front fork.

The wheels of the R 12 and R 17 types are equipped with a front fork constructed on new principles which is specially noteworthy for simplicity of design. It consists of tubes with shock absorption by means of frictionless coil springs gliding into one another in which are mounted the adjustable oil shock absorber valves.

By this type of construction the shocks acting on the front wheel are absorbed softly and almost without friction, and recoil shocks absolutely compensated.

2. Wheels and brakes.

The wheels possess double thick end spokes and the usual 19×3" safety rims. Generally they are supplied with wired 26×3.50", low pressure tyres but they may also be supplied at any time, if desired, with wired 26×3.25" high pressure tyres, and for sidecar machines 27×4", mounted on the 19×3" rim.

In the same way as the rear wheel the front wheel also is provided with a knock-out axle, making wheel removal a very easy matter. As a particular advantage we may point out that the front and rear wheel, and, if our sidecar is used, also the wheel of the sidecar are interchangeable.

The brakes provided are internal expanding brakes, completely enclosed and protected against water and dirt.

3. Mudguards.

With the rear wheel mudguard the back end may be removed. This makes it possible to take off the rear wheel easily without having to tilt the machine laterally or to lift it, which is particularly desirable with sidecar machines.

4. Hinged stands.

Every machine is fitted with two hinged stands arranged below the frame and kept in raised position by springs. To remove the wheels it is sufficient to raise the machine on the stands.

5. Headlamp.

The head light contains a two-filament lamp for distance and dimming and an auxiliary lamp for parking. To set the engine in motion insert the switch-key into the orifice arranged above the speedometer and push it firmly home (fig. 19). This completes the circuit as shown by the lighting of the red check lamp in the head light casing. Turning the key to the left or to the right switches the parking light or the two-filament lamp respectively. (See fig. 19.)

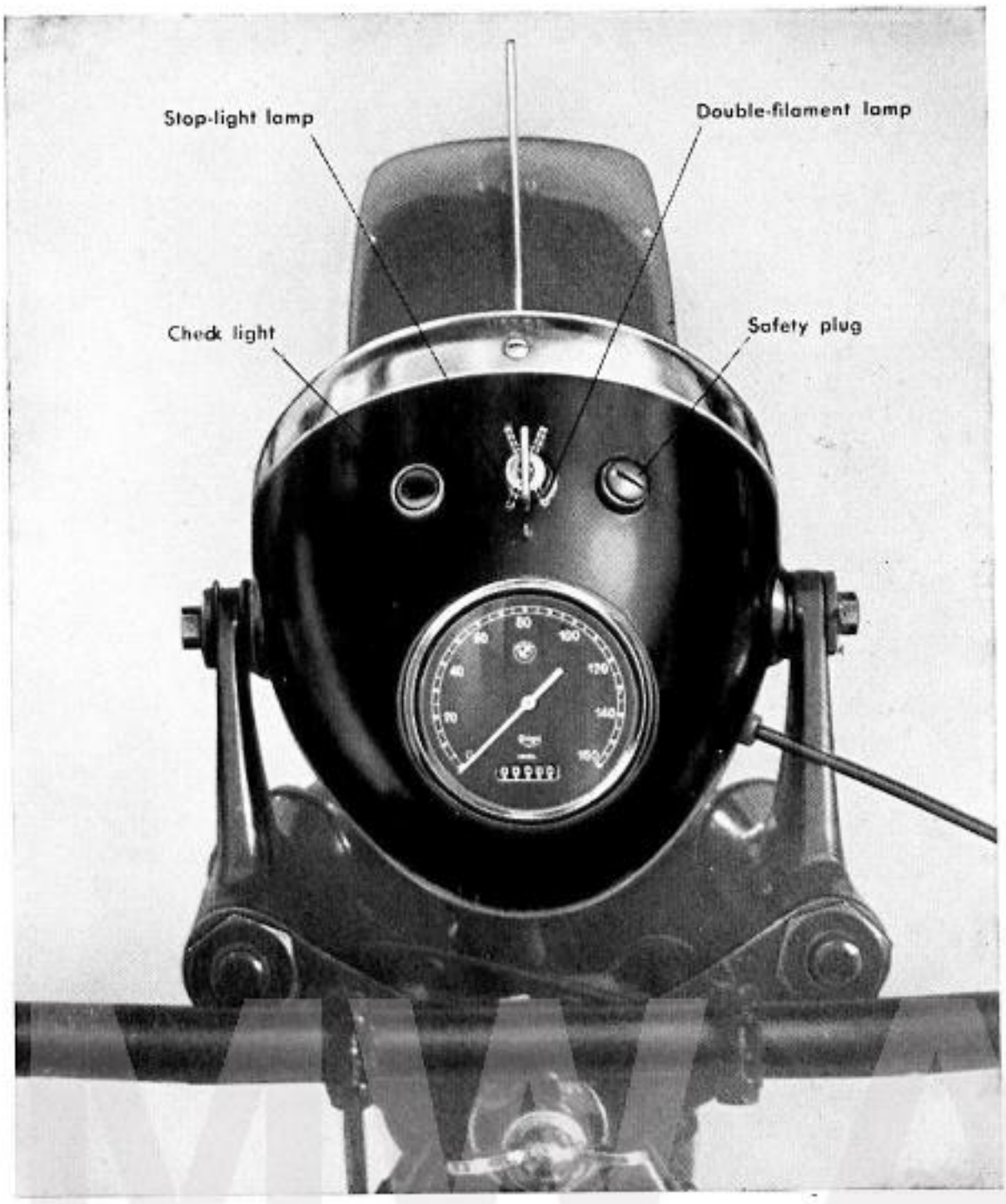


Fig. 19 Headlight from above showing positions of the switch-key

The optional switching on of the distance or dimming light of the two-filament lamp is effected by a dimming switch fixed to the right grip of the handlebar (fig. 5). The speedometer is housed in the headlamp casing and driven by means of a worm and worm-wheel from the gearbox.

6. Tools.

The tools are housed conveniently in a container cast into the gear casing.

IV. Repairs.

1. Valve timing and ignition.

If the crankshaft has been taken out for some reason or other, the valve timing must be adjusted anew after the crankshaft has been mounted again. Also, before refitting the crankshaft, the oil chambers in the pins must be freed carefully from any dirt that might have collected there.

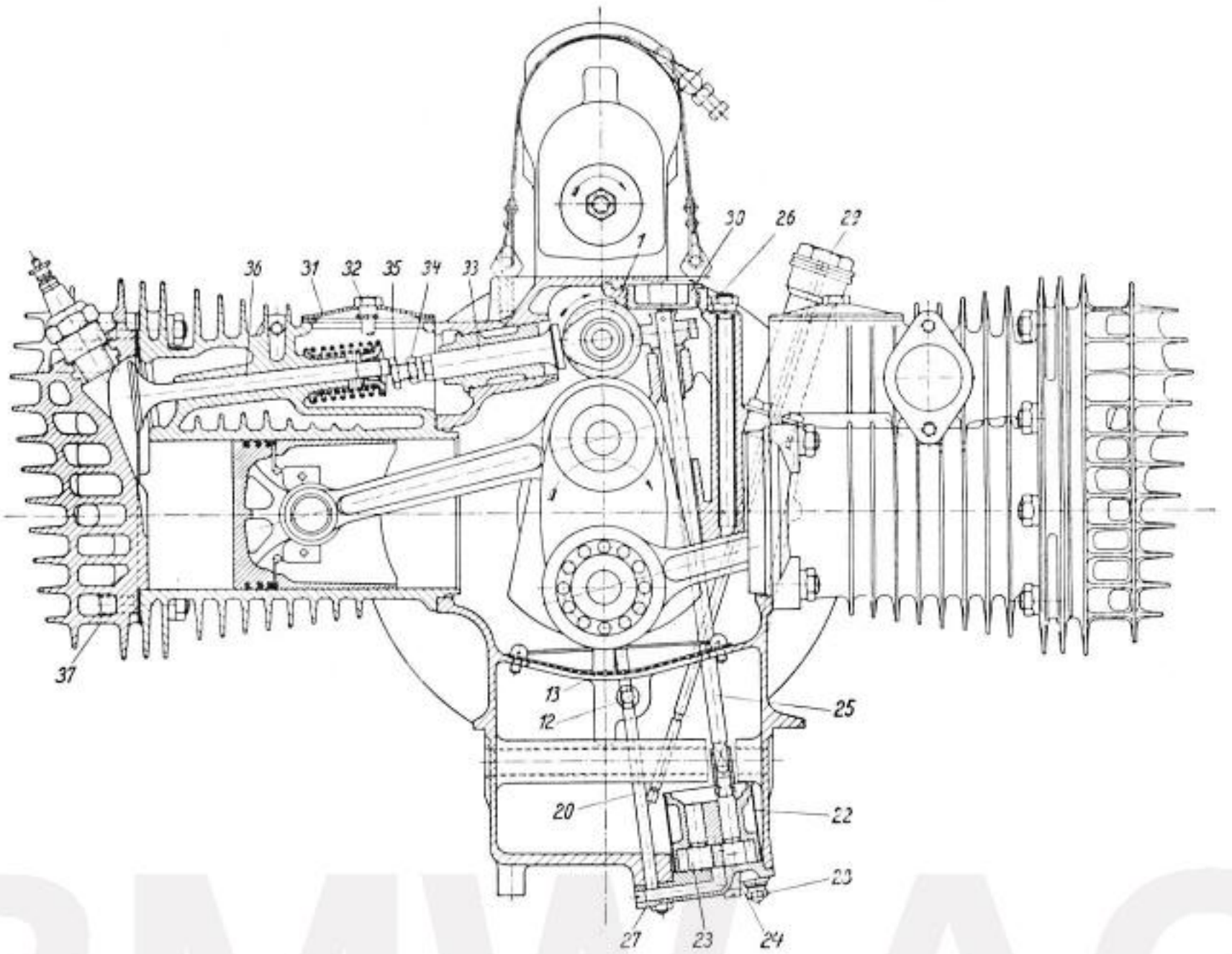


Fig. 20 Touring engine with partial cross section through the middle of the cylinder

With the yearly overhaul this cleaning must be attended to under all circumstances. When replacing care must be taken that the recesses of the ball bearing bushes 15 and 16 coincide with the oil jets 14 of the rising piping 13, as otherwise the oil supply to the bearings is interrupted (fig. 13).

The **valve timing** must be effected in the following manner:

Once the crankshaft is fitted and the chain sprocket to drive the camshaft fastened to it, adjust the piston of the adjustment cylinder (the cylinder lying to the **right** when viewed in the direction of travel) to the upper dead centre. When doing so, the mark on the chain-wheel on the crankshaft must point vertically upwards. Now the camshaft is turned until the mark on the chain wheel fastened on the camshaft aligns with the mark on the crankshaft chain wheel, and then the chain is placed on. It serves as a check that in this position the inlet valve must be already opened.

If it should not be possible to bring the two marks into exact agreement, which might occur if the driving chain has stretched, it is advisable to make use of the timing diagrams (figs. 21 and 22). According to these, for instance with the touring machine, the crankshaft before turning to upper dead centre must be turned back by the amount of the previous opening of the inlet valve. (2.8 mm stroke of piston, compare fig. 37, seen in travelling

direction towards the right, clockwise.) Next the camshaft must be adjusted in such a way that the inlet valve of the adjustment cylinder is just on the point of opening (direction of rotation of the camshaft the same as that of the crankshaft, that is seen in travelling direction to the left, anti-clockwise) and in this position the driving chain must be laid on.

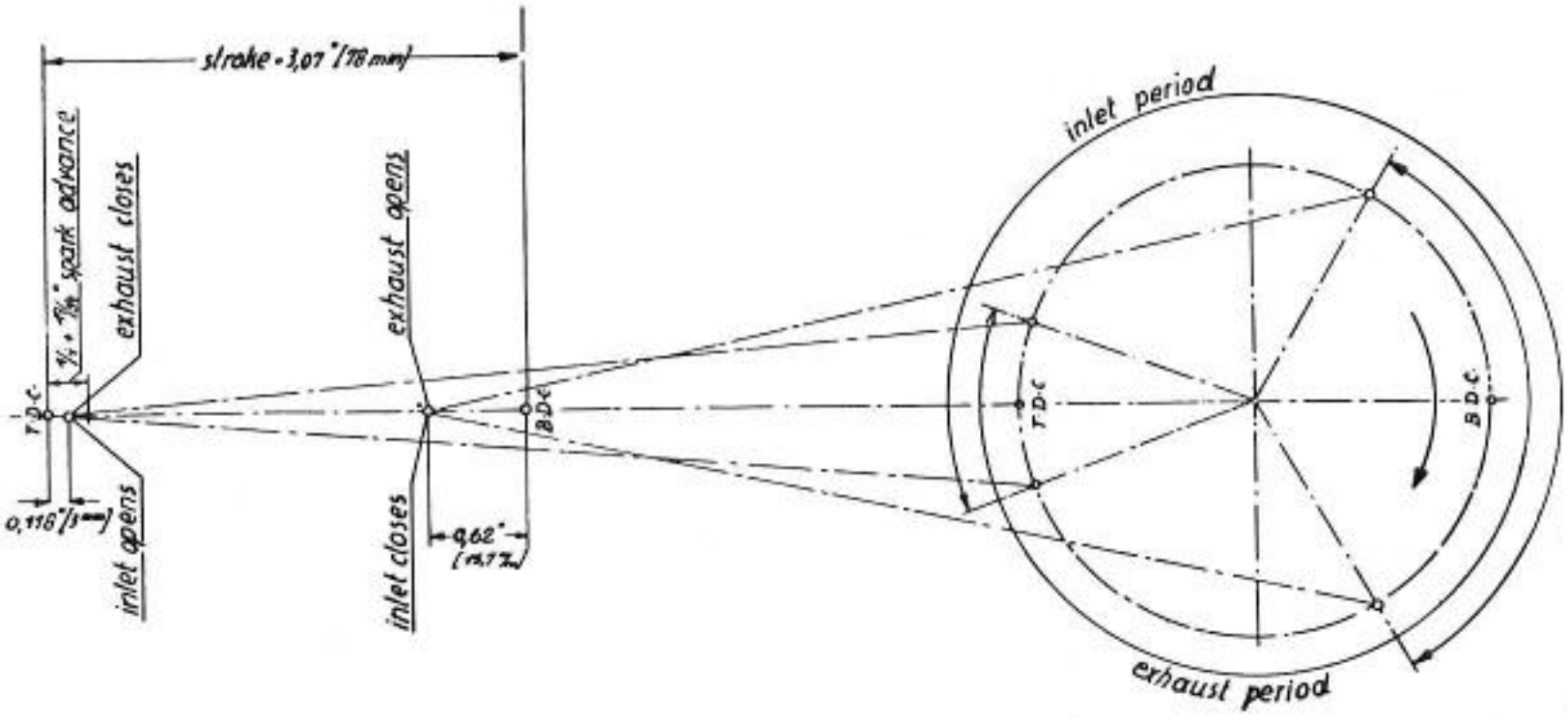


Fig. 21 Timing diagram for the touring machine

Special caution! The timing diagrams are viewed in a direction opposite to travelling direction. Therefore the direction of rotation of the crank or camshaft looking towards the spur drive is opposite to the one mentioned in the preceding instructions.

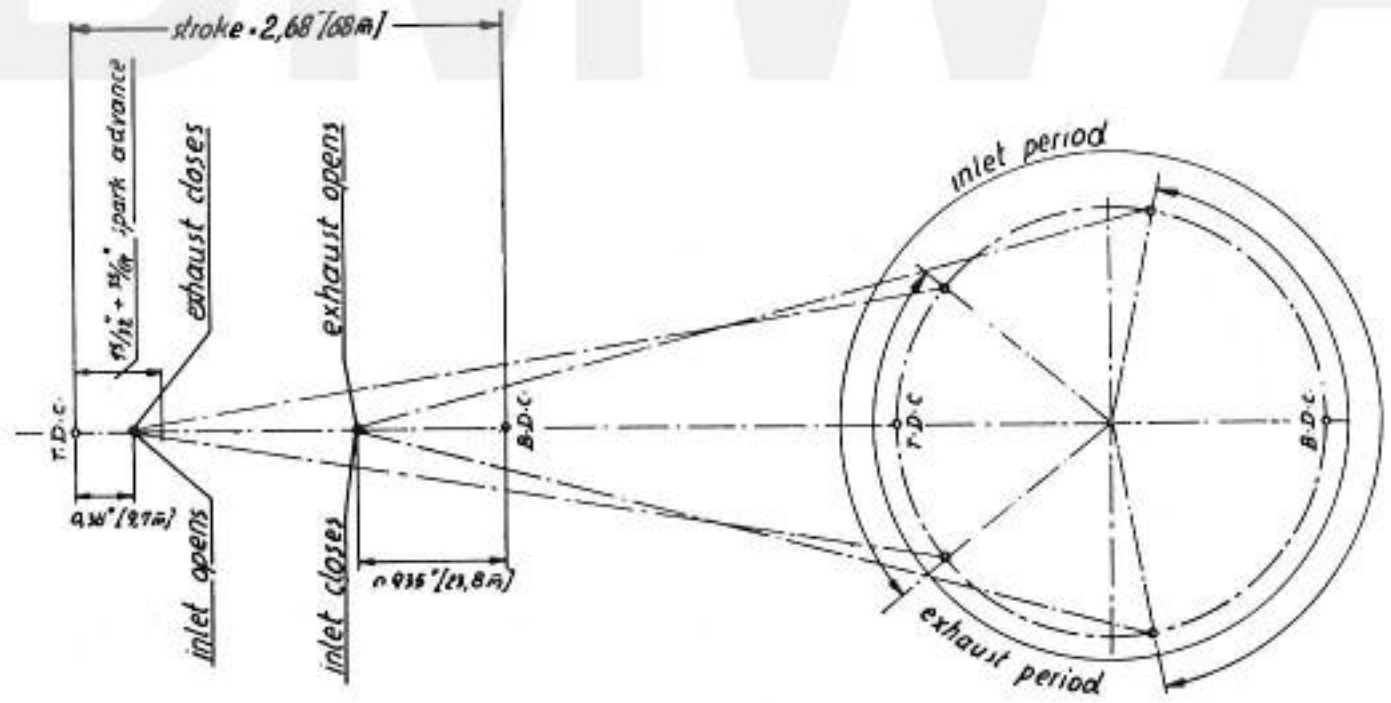


Fig. 22 Timing diagram for the sports machine

When the **lighting and ignition battery or magneto** has been removed and replaced, the contact breaker cover (figs. 9 and 10) must be removed and advanced ignition adjusted first, the adjustment lever arranged at the right having to be directed downwards. Adjust the contact breaker in such a way that it is just on the point of opening, i. e., the contact pin of the contact breaker lever 107 b (figs. 9 and 10) must just separate from the fixed contact pin 107 a.

The **adjustment of the ignition** must be effected in the following manner:

Touring machine. After removing the cylinder head of the cylinder lying at the right when viewed in travelling direction, adjust the crankshaft to the upper dead centre at the end of the compression stroke. Both valves must then be closed. If the magneto is to be fitted after adjustment of the valve timing, the crankshaft must be given another turn through exactly 360° in the sense of rotation of the engine (viewed in travelling direction to the left (anti-clockwise) so as to be able to mount the lighting and ignition battery or magneto, after having adjusted the piston of the adjusting cylinder for adjustment of the camshaft to the upper dead centre. Then turn the crankshaft back (to the r i g h t viewed in travelling direction, clockwise), until the piston has travelled a path of 7—8 mm (compare diagram fig. 21). In this position place the chain between the camshaft chain wheel and the driving wheel of the light or ignition magneto which has been adjusted according to the above instructions.

Sports machine. Adjust the piston of the adjustment cylinder to the upper dead centre at the end of the compression stroke. This is easily done by means of a feeler gauge introduced through the bore for the sparking plug. When doing so, the valves must be closed, which may easily be determined by the rocker levers after having removed the protective cap of the valve levers. In case the cylinder head has been removed, the position of the camshaft or the valves may be watched by the tappet rods.

Then the crankshaft is turned back (to the right viewed in travelling direction, clockwise) until the piston has travelled a distance of 12 to 14 mm (compare diagram fig. 22). In this position place the magneto, adjusted in the manner described above, on the crankcase on the platform provided on it for this purpose, place the driving chain in position, and fasten the magneto by means of the tightening band.

2. Adjustment of the carburetters.

The carburetters are adjusted at the works for the usual brands of fuel so that as a rule no exchange of jets will be required.

a) Two-carburetter machine.

The **normal adjustment** of the carburetters of the **R 17 machine** is:

Slide-valve 6/4, bore of inserted jet body 1", main jet 140, position of needle 3, that is the clamp-spring is in the 3rd recess from above.

Any adjustments to winter or summer condition or also to definite fuels may be effected by adjustment of the jet needle.

The carburetters of the **R 12 machine** are equipped with throttle slide valve 6/4 and main jet 110. The interior diameter of the mixing chamber is 24 mm. If the mixture should be too poor with the normal 110 main jet, the jet 120 may be used. The normal position of the needle is: clamp spring in the third recess of the jet needle from above.

Regulation of the idle: The idle should not be checked or regulated except with the warm engine. Before adjustment the Bowden wires must be loosened at the Bowden wire set screws on the covers of the slide valve casings. Then adjust the idle as uniformly as possible for both carburetters at the throttle slide valve stop screws arranged laterally on the slide valve casing with closed throttle twist grip and fully retarded ignition. To check the adjustment remove afterwards the ignition cable of the one cylinder from the sparking plug. Then the second cylinder must continue to work slowly and evenly. If the condition that with alternate removal of the ignition-cables the other cylinder continues to work in the prescribed manner, is fulfilled, the total adjustment of the idle running is correct.

Thereupon remove the end play in both throttle cables at the Bowden adjusting screws with the throttle twist grip remaining closed as before, and the adjustment of the idle running is completed.

A supplementary adjustment of the Bowden wires will be necessary from time to time so as to secure good transitions and uniform working of both cylinders.

b) Single-carburetter machine.

Regulation of the idle: The idle running must not be checked or regulated except with the warm engine. We therefore recommend first riding one or two miles slowly. If the idle running should not be satisfactory then, it must be adjusted in the following manner:

First loosen the Bowden wire at the Bowden wire set screw on the slide valve cover and regulate the number of revolutions of the motor with the throttle slide valve stop screw 11 (fig. 13), the throttle twist grip closed and the ignition twist grip adjusted to fully retarded ignition. Then the correct composition of the mixture must be adjusted with the air throttle screw 12 (fig. 14). If any smoke appears at the exhaust which points to abundance of fuel, the air screw must be unscrewed, more air being supplied and the mixture consequently becoming poorer thereby. If the engine stops in idle running, this being a sign of the mixture being too poor, the air screw must be screwed in, whereby the supply of air is throttled and the mixture becomes richer.

After having adjusted the number of revolutions and the composition of the mixture for idle running correctly in this manner, remove again the end play in the Bowden wire at the Bowden wire set screw, so that the throttle slide valve opens the main air cross section immediately when the throttle twist grip is operated.

When adjusting the idle running the starting device must be kept closed under all circumstances.

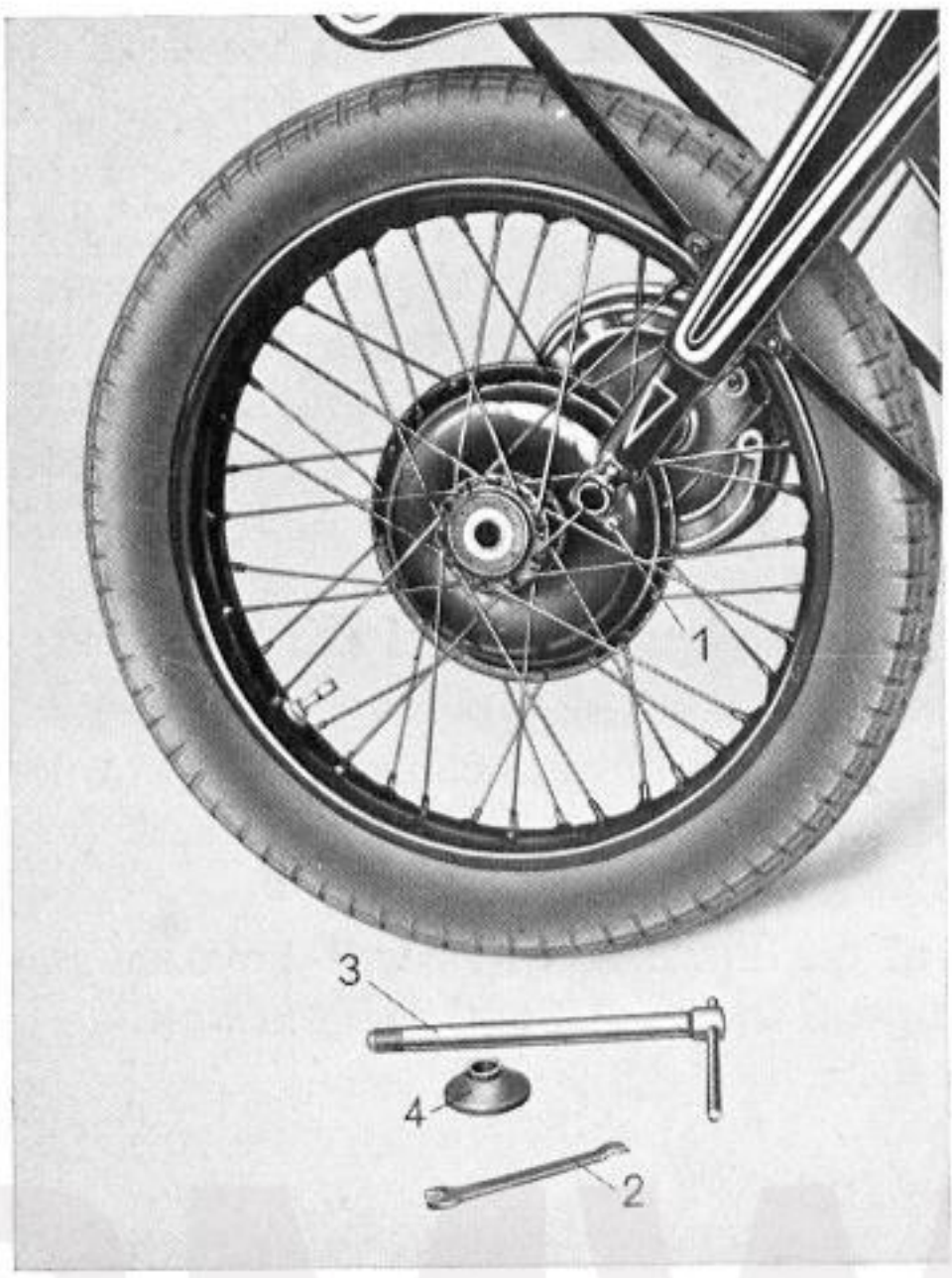


Fig. 23
Dismantling the front-wheel

3. Dismantling the front wheel.

Raise the motor cycle first on the front hinged stand and then loosen the clamp screw 1 at the lower end of the left prong with spanner 2 (fig. 23). Now the knock-out axle 3 may be screwed out by turning it to the left.

After removal of the knock-out axle 3 and the distance piece 4, the wheel may be pulled off the brake-shoes and then taken out of the fork (fig. 23).

4. Dismantling the rear wheel.

The rear wheel is dismantled just as simply as the front wheel. With **solo machines** the best way of dismantling the rear wheel is laying the machine over the right running board — viewed in travelling direction — on the right cylinder and unscrewing then the knock-out axle 5 by turning it to the right; the distance piece 6 may now be removed, the rear wheel pulled off the driving splines and brake shoes and taken out downwards (fig. 24).

With **sidecar machines** the machine is placed on the rear hinged stand, the two nuts 7 and 8 are loosened which hold the lateral supports of the rear part of the mudguard to the rear wheel drive casing or frame as well as the nut 9 on the mudguard below the luggage carrier. After unscrewing the tail light the rear part of the mudguard can be removed.

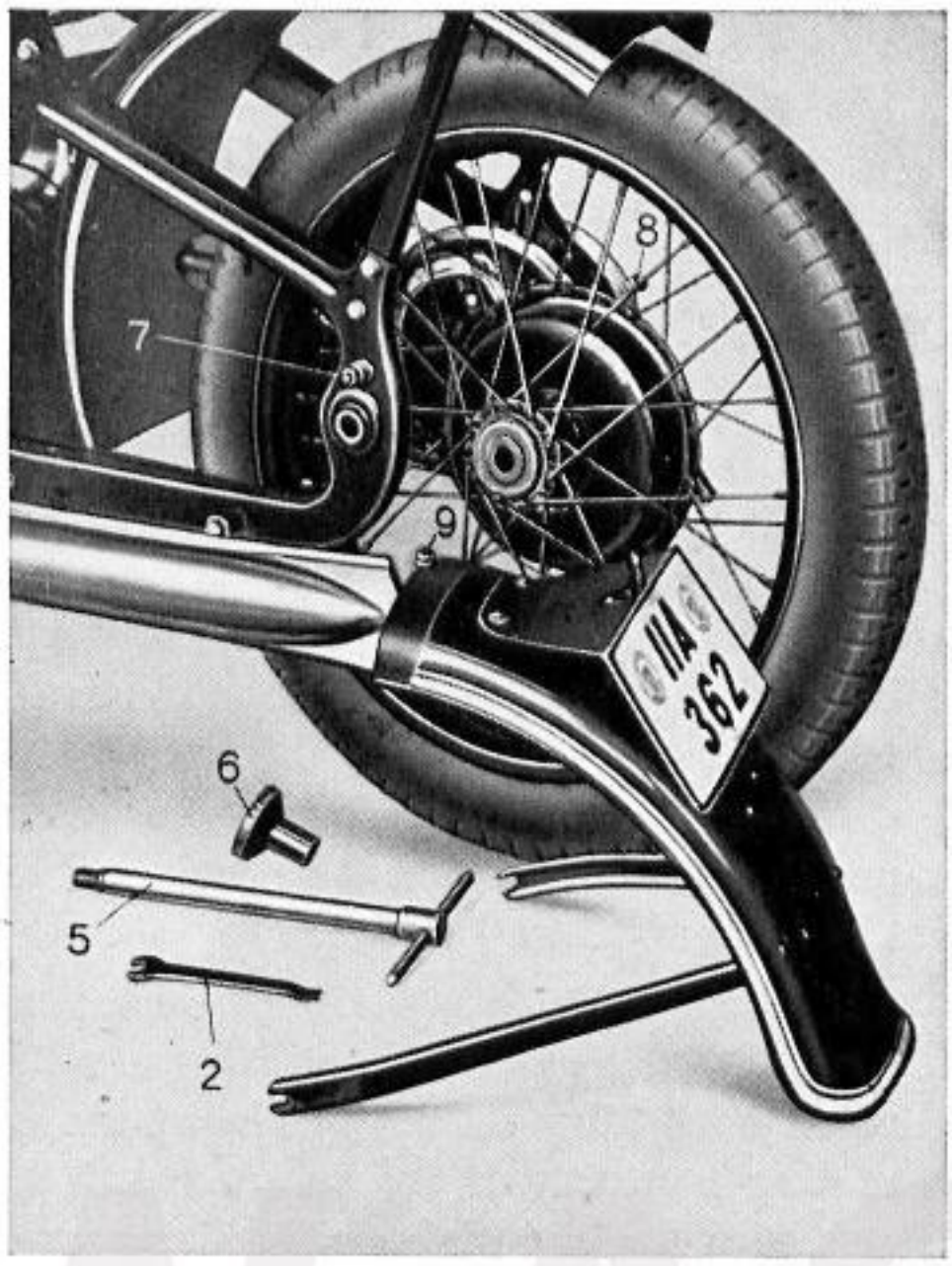


Fig. 24
Dismantling the rear wheel with solo machines

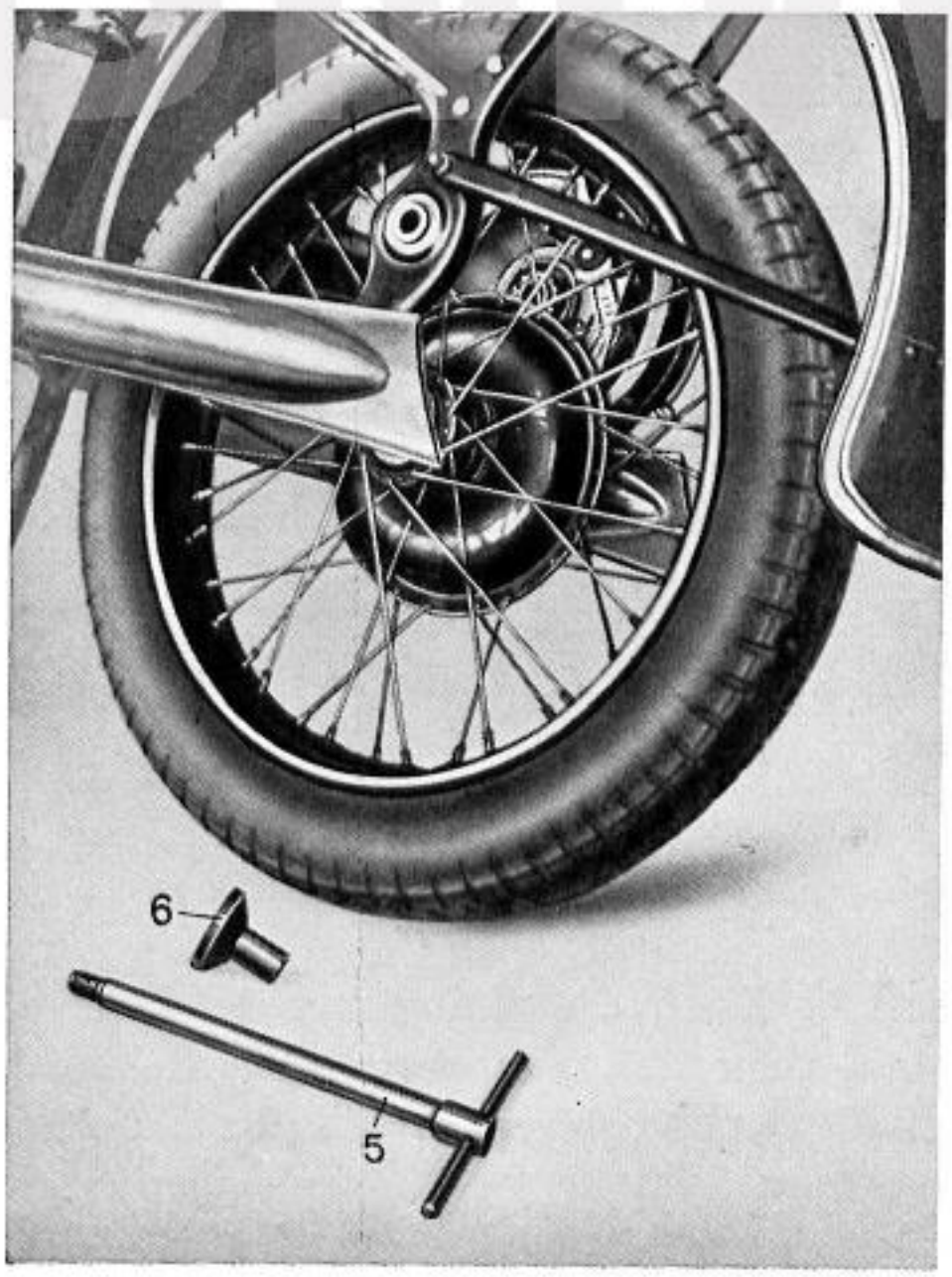


Fig. 25
Dismantling the rear wheel with sidecar machines

Now the procedure is the same as with the solo machine, the knock-out spindle 5 and the distance piece 6 are removed, the wheel is pulled off the driving splines or brake shoes and rolled backwards out of the frame (fig. 25).

Great care must be taken that in exchanging the tyres no dirt gets into the driving splines and that the rear wheel be mounted only with absolutely clean splines.

5. Dismantling the engine body.

The construction of the engine body is so simple that many parts are accessible without dismantling the engine or gearbox. The laterally projecting cylinders may be taken off after removal of the carburetters and exhaust pipes and after loosening the fixing nuts, so that the pistons with the connecting rods are exposed. When pulling off the cylinders care must be taken that pistons, connecting rods, and cylinder bores of the crankcase are not damaged and that the tappets do not drop out.

If, besides, the **piston** is to be removed **from the connecting rod,** the **removal or pressing-in again of the gudgeon pin** must not be effected until after the safety rings have been taken out, **when the piston has been warmed up to at least 212° F.** This had best be done by means of a heating plate, in boiling weater, or hot oil.

To remove the upper part of the crankcase, the entire body must be taken out of the frame. Previously the fuel tank must be taken off after removal of the fuel piping and the three head screws, further the rear wheel drive connection must be detached. Before removing the upper part of the crankcase the gearbox must be removed by loosening the three fixing nuts and pulling out the two head screws, after having unscrewed the gear lever cover, dismantled the speedometer driving shaft and taken off the clutch cable.

Important. Before dismantling the halves of the crankcase the screw plug 30 must be removed; then pull out the driving shaft 25 with worm wheel 26 by means of flat pliers (fig. 20).

Then the halves of the crankcase may be taken apart, and the entire driving gear is accessible.

So as to get access to the gearbox itself, the fixing nuts on the rear gearbox cover must be loosened, and then the rear cover with the main shaft and countershaft may be pulled out, but the oil in the gearbox must be drained first. We must, however, repeat the caution already given: put all gearbox repairs in expert hands.