KNOW YOUR CARBY

● *Ninth in a series on maintaining popular makes of carburettor*

No. 9.—AMAL "Monobloc" Types 375, 376 and 389

THE carburettor proportions and atomises the right amount of petrol with the air that is drawn in by the engine because of the correct proportions of jet sizes and the main choke bore. The float chamber maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.

The throttle control from the handlebar controls the volume of mixture and therefore the power, and at all positions of the throttle the mixture is automatically correct. The opening of the throttle brings first into action the mixture supply from the pilot jet system for idling, then as it progressively opens, via the pilot by-pass, the mixture is augmented from the main jet, the earlier stages of which action are controlled by the needle in the needle jet. The pilot jet system is supplied by a pilot jet which is detachable for cleaning purposes and which, when assembled in the carburettor body, is sealed by a cover nut. The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol-air mixture through the primary air choke into the main air choke. This primary air choke has a compensating action in conjunction with bleed holes in the needle jet, which serve the double purpose of air compensating the mixture from the needle jet and allowing the fuel to provide a well outside and around the needle jet, which is available for snap acceleration.

The carburettors usually have a separately-operated mixture control called an air valve, for use when starting from cold, and until the engine is warm; this control partially blocks the passage of air through the main choke.

This design of carburettor offers perfectly simple and effective tuning facilities.

STARTING THE ENGINE

When starting from cold, flood the carburettor by depressing the tickler sharply three or four times, and close the air valve; set the ignition, say, half retarded. Then shut the throttle and open it a little, viz., about one-eighth open, see Fig. 2, position 2, then kick-start. If it is open too much, starting will be difficult.

Do not flood the carburettor when starting with the engine hot, but close the air valve. Set the ignition and close the throttle, then open the throttle about one-eighth of its travel and kick-start. If the carburettor has been flooded and will not start because the mixture is too rich, open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle one-eighth open, and air valve wide open. Generally speaking it is not advisable to flood at all when an engine is hot. By experimenting, find out if and when it is necessary to flood, also note the best position for the air valve and the throttle for the easiest starting.

When starting with single lever carburettors open the throttle very slightly from the idling position and flood the carburettor more or less

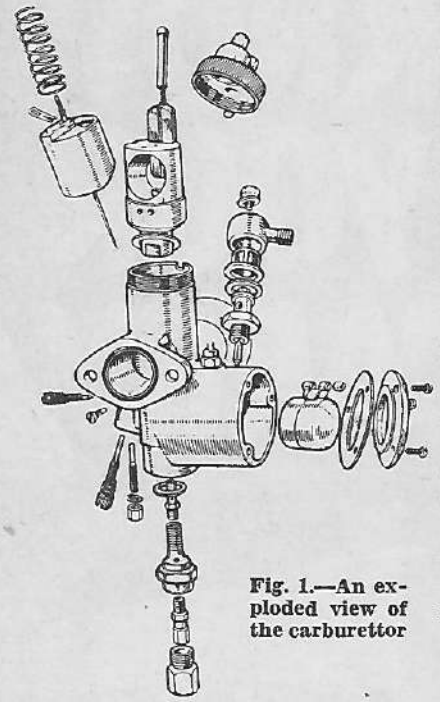

Fig. 1.—An exploded view of the carburettor

according to the engine being cold or hot respectively. See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjusters on the top of the carburettor. See that the throttle shuts down freely.

PETROL FEED

Later models are fitted with a filter gauze at the inlet to the float chamber. To remove the filter gauze unscrew the banjo bolt 22 (see Fig. 3), the banjo can then be removed and the filter gauze withdrawn from the needle seating. Ensure that the filter gauze is undamaged and free from all foreign matter. Before replacing the banjo, turn on petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops, as they cause air locks. Flooding may be due to a worn needle or a leaky float, but nearly all flooding with new machines is due to impurities (grit, fluff, etc.), in the tank—so clean out the float chamber periodically till the trouble ceases. If the trouble persists, the tank should be drained and swilled out.

Banging in exhaust may be caused by too weak a pilot mixture when the throttle is closed or nearly closed —also it may be caused by too rich a pilot mixture and an air leak in the exhaust system; the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the banging happens when the throttle is fairly wide open the trouble will be ignition—not carburation.

FIXING CARBURETTORS AND AIR LEAKS

Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe—check by means of an oil can and eliminate by new washers and the equal tightening up of the flange nuts. On later models a sealing ring is fitted into the attachment flange of the carburettor. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

Bad petrol consumption of a new machine may be due to flooding, caused by impurities from the petrol tank lodging on the float needle seat and so preventing its valve from closing. Flooding may be caused by a worn float needle valve. Also bad petrol consumption will be apparent if the needle jet 15 (see Fig. 4) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be lowered, then the only remedy is to get a new needle jet.

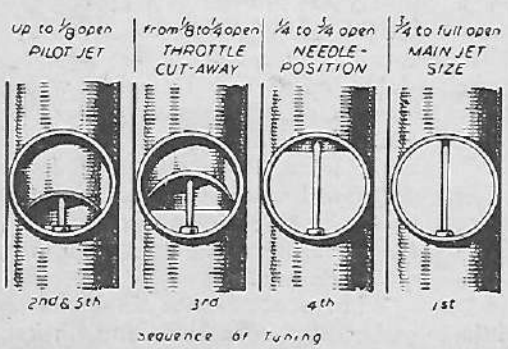

Fig. 2.—Phases of Amal needle jet carburettor throttle openings.

AIR FILTERS

These may affect the jet setting, so if one is fitted to the carburettor afterwards, the main jet may have to be smaller. If a carburettor is set with an air filter and the engine is run without it, take care not to overheat the engine due to too weak a mixture. Testing with the air valve will indicate if a larger main jet and higher needle position are required.

EFFECT OF ALTITUDE ON CARBURETTOR

Increased altitude tends to produce a rich mixture. The greater the altitude, the smaller the main jet required. Carburettors ex-works are set suitable for altitudes up to 3,000ft. approximately. Carburettors used constantly at altitudes 3,000ft. to 6,000ft. should have a reduction in main jet size 5 per cent, and thereafter for every 3,000ft. in excess of 6,000ft., further reductions of 4 per cent should be made. This information should be useful for owners in alpine regions of Australia.

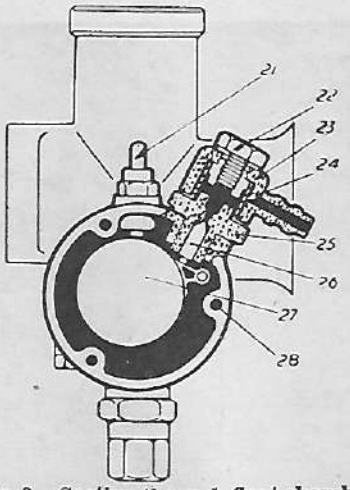

Fig. 3.—Section through float chamber.

REASSEMBLING

When reassembling after dismantling, see that the washer on the bottom of the jet blocks is in good condition, otherwise fuel will leak across its face causing rich erratic running. If the washer is faulty it should be replaced by a new one. When replacing the throttle see that the jet needle goes into the centre hole in the jet block and, once in, note the throttle works freely when the mixing chamber cap 2 (see Fig. 6) is screwed down firmly and held by spring 18.

When reassembling the float see that the narrow leg portion of its hinge is uppermost, as this operates the needle. Care should be taken to see that the joint faces of the side cover and body are not damaged or

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bruised, and that the joint washer is in good condition, otherwise difficulty will be experienced in making a petrol-tight joint.

HOW TO TRACE FAULTS

There are only two possible faults in carburation, either richness or weakness of mixture.

Indications of: RICHNESS	WEAKNESS
Black smoke in exhaust.	Spitting back in carburettor.
Petrol spraying out of carburettor.	Erratic slow running. Overheating.
Four strokes, eight-stroking.	Acceleration poor. Engine goes better if:—
Two strokes, four-stroking. Heavy, lumpy running. Sparking plug sooty.	Throttle is not wide open or air valve is partially closed.

If richness or weakness is present, check if caused by:—

(1) Petrol feed.	Check that jets and passages are clear, that filter gauze in float chamber banjo connection is not choked with foreign matter, and that there is ample flow of fuel.
(2) Air leaks.	At the connection to the engine or due to leaky inlet valve stems.
(3) Defective or worn parts.	As a loose fitting throttle valve, worn needle jet, loose jets.
(4) An air cleaner being choked up.	
(5) An air cleaner having been removed.	

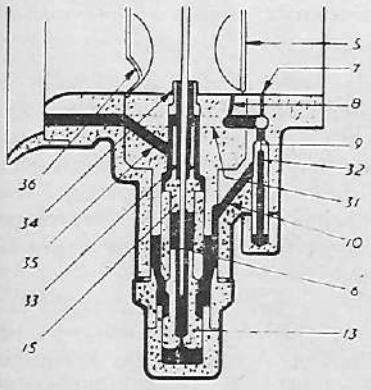

Fig. 4.—Diagrammatic section of carburettor showing only the lower half of the throttle chamber with the throttle slightly open and the internal primary air passage to the main jet and pilot system.

Removing the silencer or running with a straight-through pipe requires a richer setting.

Having verified the correctness of fuel feed and that there are no air leaks, check over ignition, valve operation and timing. Now at throttle position shown on Fig. 2, test to see if mixtures are rich or weak. This is done by partially closing the air valve, and if engine runs better, weakness is indicated,

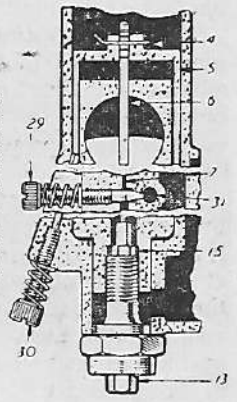

Fig. 5. — Three diagrammatic sections of the carburettor to show the throttle adjusting screw 30, and the pilot air adjusting screw 29.

but if engine runs worse richness is indicated.

To remedy, proceed as follows:—

TO CURE RICHNESS	TO CURE WEAKNESS
Position 1: Fit smaller main jet.	Fit larger main jet.
Position 2: Screw out pilot air adjusting screw.	Screw pilot air adjusting screw in.
Position 3: Fit a throttle with larger cut-away.	Fit a throttle with smaller cut-away.
Position 4: Lower needle one or two grooves.	Raise needle one or two grooves.

NOTE.—It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle; the proper thing to do is to lower the needle.

SEQUENCE OF TUNING

The carburettor is automatic throughout the throttle range — the air valve should always be wide open except when used for starting or until the engine has warmed up. It is assumed that normal petrols are used.

1st Main Jet—with throttle in position 1 (Fig. 2). If at full throttle the engine runs "heavily" the main jet is too large. If at full throttle by slightly closing the throttle or air valve the engine seems to have better power, the main jet is too small.

With a correct sized main jet the engine at full throttle should run evenly and regularly with maximum power.

If testing for speed work ensure that the main jet size is sufficient for the mixture to be rich enough to keep the engine cool, and to verify this, examine the sparking plug after

KEY TO DIAGRAM NUMBERS

1. Mixing chamber top.	20. Cable adjuster (throttle).
2. Mixing chamber cap.	21. Tickler.
3. Carburettor body.	22. Banjo bolt.
4. Jet needle clip.	23. Banjo.
5. Throttle valve.	24. Filter gauze.
6. Jet needle.	25. Needle seating.
7. Pilot outlet.	26. Needle.
8. Pilot by-pass.	27. Float.
9. Pilot jet.	28. Side cover screws.
10. Petrol feed to pilot jet.	29. Pilot air adjusting screw.
11. Pilot jet cover nut.	30. Throttle adjusting screw.
12. Main jet cover.	31. Air to pilot jet.
13. Main jet.	32. Feed holes in pilot jet.
14. Jet holder.	33. Bleed holes in needle jet.
15. Needle jet.	34. Primary air choke.
16. Jet block.	35. Primary air passage.
17. Air valve.	36. Throttle valve cut-away.
18. Mixing chamber cap spring.	
19. Cable adjuster (air).	

taking a fast run, declutching and stopping the engine quickly. If the plug body at its end has a cool appearance the mixture is correct; if sooty, the mixture is rich; if, however, there are signs of intense heat, the mixture is too weak and a larger main jet is necessary.

2nd, Pilot Jet — (Fig. 2), with throttle in positions 2 and 5.

With engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle adjusting screw, and ignition set for best slow running: (1) screw out throttle adjusting screw until the engine runs slower and begins to

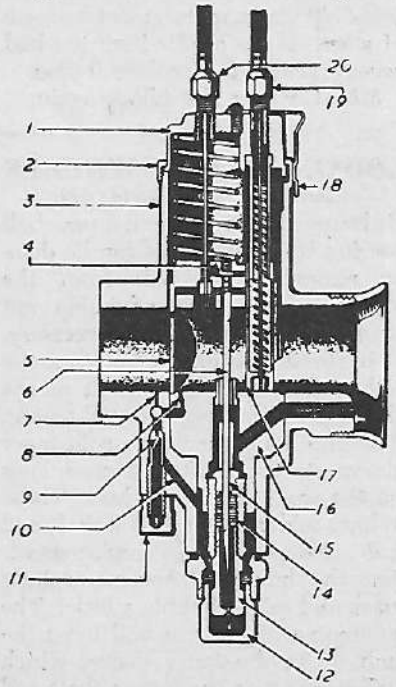

Fig. 6.—Section through mixing chamber, showing air valve and throttle closed.

falter, then screw pilot air adjusting screw in or out to make engine run regularly and faster. (2) Now gently lower the throttle adjusting screw until the engine runs slower and just begins to falter, adjust the pilot air adjusting screw to get best slow running; if this second adjustment makes engine run too fast, go over the job again a third time.

3rd, Throttle Cut-Away.—Throttle in position 3 (Fig. 2). If, as you take off from the idling position, there is spitting from the carburettor, slightly richen the pilot mixture by screwing in the air screw sufficiently, but if this is not effective, screw it back again and fit a throttle with a small cut-away. If the engine jerks under load at this throttle position and there is no spitting, either the jet needle is much too high or a larger throttle cut-away is required.

4th, Needle.—Throttle in position 4 (Fig. 2). The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, viz., with the clip in a groove as near the top as possible; if acceleration is poor and with air valve partially closed, the results are better, try lowering needle by one groove and leave it where it is best. If mixture is still too rich with clip in groove No. 1 nearest the top, the needle jet probably wants replacement because of wear. If the needle itself has had several years' use, replace it also.

5th.—Go over the idling again.

Fig. 5 is three diagrammatic sections of the carburettor to show the throttle adjusting screw 30, and the pilot air adjusting screw 29.

Throttle adjusting screw.—Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is shut off.

Pilot Air Adjusting Screw. — This screw regulates the strength of the mixture for "idling" and for the initial opening of the throttle. The screw controls the depression on the pilot jet by metering the amount of air.

Main Jet.—The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle opening although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. Never reamer a jet out, get another of the right size. Bigger the number, bigger the jet.

To remove the main jet unscrew the main jet cover, the jet can then be unscrewed from the jet holder.

Needle and Needle Jet. — The needle is attached to the throttle valve and being tapered allows either more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or nearly full throttle.

The taper needle position in relation to the throttle opening can be set according to the mixture required by fixing it to the throttle valve with the jet needle clip in a certain groove (see Fig. 5), thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttle openings from quarter to three-quarters open (see Fig. 2). The needles are marked with the letters B, C or D. B type are fitted in the 375 carburettor, C type in the 376 carburettor, and D type in the 389 carburettor. The needles in some cases are marked with a number in addition to a letter.

Throttle Valve Cut-away. — The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cut-away is recorded by a number marked on the throttle valve, viz., 376/3 means throttle valve type 376 with No. 3 cut-away: larger cut-aways, say, 4 and 5, give weaker mixtures, and 2 a richer mixture.

Air Valve.—This is only used for starting and running when cold, and for experimenting with, otherwise run with it wide open.

Tickler.—A small plunger, spring loaded, in the float chamber wall. When pressed down on the float the needle valve is allowed to open and so "flooding" is achieved. Flooding temporarily enriches the mixture.

LOOSE REAR WHEELS

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endways. In cases where a new ball bearing is required, this can be done by removing the hub from the torque shaft. It is advisable not to remove this unless necessary.

If shake is apparent between the hub and the torque shaft it means that the end nut requires tightening. The hub fits up against a split taper sleeve on the shaft and on splines on the shaft and in the hub. These splines seldom wear, and a shaft and hub seldom require replacement. But the hub may become a little slack and might wobble a little. The tightening of the nut will force the hub on to the taper sleeve, which will contract on the torque shaft and make a sound and tight adjustment. This can be done without interfering with the ball race and without withdrawing the torque shaft from the live axle.

All nuts on the back plates of rear axle ends should occasionally be tested and tightened, because they nearly always hold up important members of the wheel bearings, and if these are always kept tight they will eliminate many troubles and may prevent the need of very expensive repair.

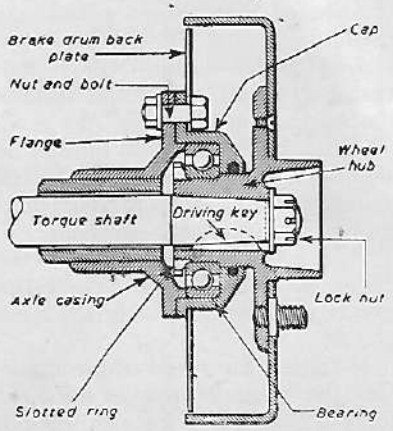

Fig. 2.—A second form of rear-wheel mounting.

These nuts invariably control end-play, which would soon wear the ball bearings. Actual wobble, as opposed to slight end-play, is always dangerous, and may prove expensive. It means, in practically all cases, a loose key or a hub loose on its splined shaft. But in testing for it make sure that the detachable wheel is tight on the hub. Shake of the detachable wheel may easily be mistaken for looseness of the hub on the drive (torque) shaft and a long adjusting job may be unnecessary.