Tuning SU Carburettors

Even though a large proportion of modern motor vehicles are now equipped with S.U. (Skinner Union) carburettors, many motor mechanics still encounter difficulty when tuning and adjusting these relatively simple units.
Such carburettors are of the variable choke type and their principle of operation is far more simple than that of the conventional or fixed choke designs. (The term choke when mentioned in this article refers to the throat or venturi of the carburettor).

Counterpart

In the fixed choke carburettor, some form of fuel-air mixture compensation must be used to counteract the effects of low pressure variations over the fuel jet. Furthermore, this type of carburettor requires separate jet and air bleed systems to deliver the correct fuel-air mixture to the engine under various conditions of operation such as idling, acceleration, full power and cruising. The size of the fixed choke itself is only a compromise. A small choke will deliver correct and stable mixtures at light throttle conditions, but will severely limit maximum engine power by restricting the flow of air at full throttle. A large diameter choke, whilst quite satisfactory for full throttle conditions, will cause poor fuel metering at low speeds because of the relatively low air velocity passing the fuel jet.

Note: Double throat progressive linkage type carburettors almost eliminate the problem of venturi size in fixed choke designs.

At light throttle, low speed conditions the mixture is supplied by one small choke (approx. 22mm).
At high speeds or full throttle conditions a second larger choke (approx. 26mm) automatically comes into operation and in conjunction with the small primary choke allows a sufficient volume of fuel-air mixture to enter the engine.
The problems associated with fixed carburettors are practically eliminated in the variable choke type. The S.U. carburettor, in most applications, requires only one fuel jet to supply the fuel needs of the engine for all speed and load conditions. The basic reason why only one jet is necessary is that a sliding piston, acting under the effect of engine manifold vacuum, automatically adjusts the size of the choke so that the air velocity and the low pressure over the fuel jet remain constant.

BASIC CONSTRUCTION
The basic construction of the S.U. carburettor is shown in Diagram No.1.

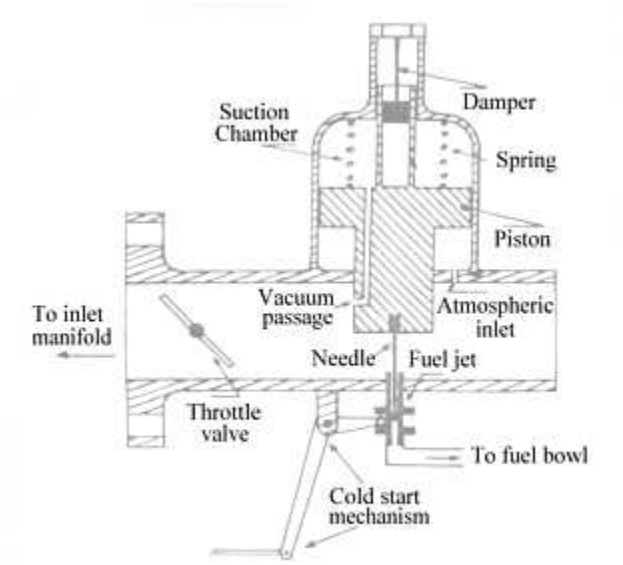

DIAGRAM No. 1

The piston is lifted against gravity and spring tension by the difference in pressure which exists between its upper and lower faces. The low pressure area which exists between the piston and throttle butterfly valve is impressed via passage to the upper face of the piston and atmospheric pressure acts on the lower face.
At idling speed the throttle valve is almost closed and only a small proportion of manifold vacuum is impressed over the piston via the vacuum passage. The piston is raised slightly and allows sufficient incoming air for the demands of the engine to pass over the fuel jet. As the throttle valve is opened, a greater proportion of manifold vacuum acts on the upper face of the piston and raises its further. Engine speed and consequently the volume of incoming air is increased, but due to the larger choke area caused by the lifting of the piston, the air velocity and the depression over the fuel jet remain constant. A great volume of air naturally requires a greater volume of fuel to maintain the correct running mixture. A tapered metering needle attached to the piston and projecting into the fuel jet automatically maintains the correct ratio of the fuel jet size to the volume of incoming air. The shape and characteristics of the metering needle governs the fuel air mixture ration for all speed and load conditions.

Sudden Rise

When the throttle valve is opened suddenly, the manifold vacuum acts almost immediately on the piston causing it to rise suddenly. The amount of air entering the engine also increases suddenly, but the extra fuel necessary to maintain the correct mixture tends to lag behind the increased volume of air. The fuel-air mixture would tend to become slightly lean and a "flat spot" would develop. Most types of S.U. carburettors now employ a hydraulic dampening device to prevent the too rapid rising of the piston. The device allows the fuel supply from the jet to remain in the correct proportion with incoming air during periods of sudden acceleration. The rich mixture required for cold starting is also obtained from the same jet in the majority of S.U. carburettors. (Some types use an electrically operated auxiliary enrichment carburettor. This is actually a small separate carburettor which by-passes the main

carburettor and admits fuel directly to the manifold when the unit is activated by a switch on the dashboard). However, in the majority of S.U. types, the rich mixture is obtained by mechanically lowering the jet by means of a cable controlled from the dashboard. When the jet is lowered away from metering needle a large annulus of the jet is exposed and an initial rich mixture is provided for all speed conditions regardless of piston height.

INTERCONNECTED
The throttle valve and the cold start enriching mechanism are interconnected so when the cold start is pulled out, the engine idle speed is increased. The first few degrees of the cold start mechanism opens the throttle valve only. Further movement lowers the fuel jet and opens the throttle valve a further amount.
Most S.U. carburettors have three basic adjustments:

1. The mixture adjustment.
   This adjustment can take the form of a large hexagon nut on the jet holder itself as in carburettor types H and HS
   or simple screw adjustment as in carburettor types HD and HS8. Whatever the form of this adjustment, its
   function is to position the height of the fuel jet relative to the metering needle.
2. The throttle adjusting screw.
   This screw functions exactly the same as the idle speed screw found on conventional carburettors. Acting against
   a stop, it holds the throttle valve open a set amount at engine idle this adjusting the engine speed to the
   manufacturer's specifications.
3. The fast idle screw.
   Situated on the linkage which interconnects the throttle valve and the cold start mechanism, this screw permits
   a quick and simple adjustment of the increased idle speed which is necessary whilst the engine is cold.
   Before attempting to tune and adjust S.U. carburettors, it is always advisable to carry out certain preliminary
   checks.

Firstly, the other features which affect engine tuning. i.e., spark plugs, distributor, ignition timing and tappets should all be adjusted to maker's specifications. Before tuning it is also advisable that the carburettor(s) is removed and checked. The fuel bowl needle and seat must be checked to perfect seating. If there is any doubt as to the condition of the needle and seat it should be replaced because a steady fuel level is essential when adjusting the mixture. Likewise the fuel level in the bowl should be correct. Diagram No. 2 shows the correct float setting for carburettor types H and HD and Diagram No.3 shows those for types HS and HS8. The metering needle must be from the bends and must be fitted so that the shoulder on its shank is flush with the base of the piston (see Diagram No. 4).

DIAGRAM No.2

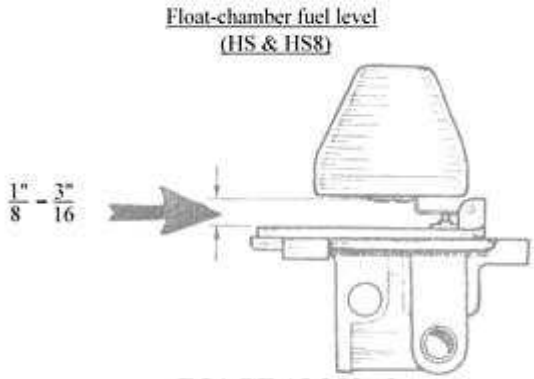

DIAGRAM No.3

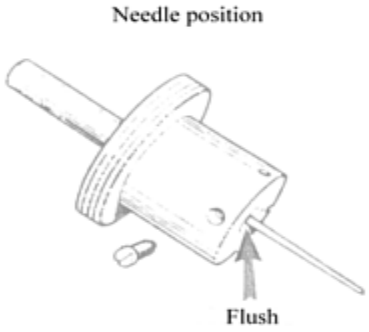

DIAGRAM No.4

Piston Freedom

Freedom for the piston to slide is also essential. After being lifted to the top of its travel and then released it should fall smoothly onto the carburettor bridge with a distinct "click" when the jet is at its highest position.
If it does not comply with this requirement, either the piston is sticking in its bore or the jet requires centering.
A sticking piston can usually be freed by removing the suction chamber and piston and washing them in a suitable
solvent. A small amount of light oil can be placed on the small diameter piston rod

but never under any circumstances on the larger diameter grooved piston face. The jet is centred in carburettor types H, HS and HS8 by the following method.

1. Disconnect the cold start mechanism and swing it to one side. On type HS8 carburettors disconnect the jet
   adjusting linkage.
2. Mark the position of the jet. Remove the jet, the jet adjusting nut and the locking spring. (The jet does not have
   to be removed by HS8 types).
3. Replace the jet adjusting nut without the spring and install the jet in its correct position according to the mark.
   Screw the jet adjusting nut up as far as it can go. (Types H and HS only).
4. Remove the hydraulic damper from the suction chamber and loosen the jet holding nut until the jet holder is free
   to move.
5. Push the piston down with a pencil or screwdriver at the same time holding the jet at its highest position.
6. Tighten the jet holder nut and check that the piston falls onto the carburettor bridge with the distinct click.
   If not, steps 4 and 5 will have to be repeated.
7. Replace the jet nut locking spring (types H and HS) and re-assemble the cold start mechanism or jet adjusting
   linkage as the case may be.
   Note: It is important that the jet is marked and kept in the same relative position during the process of centring and final assembly.
   The centring in carburettor for type HD is as follows:

The centring in carburettor for type HD is as follows:

1. Disconnect the jet adjusting linkage.
2. Remove the float chamber, the jet and diaphragm assembly, and the jet housing. (Four screws).
3. Loosen the jet holder nut so that the jet holder is free to move.
4. Install the jet and diaphragm assembly and push up the jet as far as it will go. Remove the damper from the
   suction chamber.
5. Carry out steps 5, 6 and 7 as previously described for type H, HS and HS8 carburettors.
   Note: The jet and diaphragm must be kept in the same relative position during centring and final assembly.

ADJUSTMENTS ON VEHICLE

The engine should be run until normal operating temperature is reached before attempting the tuning of the carburettor.

Single carburettor (all types)

1. Disconnect the cold start cable if fitted or make sure that the switch of the auxiliary carburettor is in the "off"
   position.

2. Screw the jet adjusting nut or screw so that the jet is flush with the carburettor bridge or, if this cannot be attained to its highest position.
3. Turn down the jet nut or adjusting screw two full turns (Type HD two and a half turns). This is the basic mixture setting for the carburettor.
4. Start the engine and adjust the throttle adjusting screw until the engine is idling at the speed recommended by the manufacturer.
5. Turn the jet adjusting nut or screw either up or down until the fastest and most even running of the engine is obtained. Turning the nut or screw upwards will weaken the mixture and vice versa. (It may be necessary to re-adjust the throttle adjusting screw during this process.)
6. The mixture strength can readily be checked by lifting the piston approx. 1/32". Most carburettors now incorporate in-built lifting pin, but in some older designs a screw driver may be used. When the piston is lifted the engine speed should increase very slightly if the mixture is correct. A rich mixture will cause the engine speed to increase considerably while a lean mixture will cause an immediate decrease of speed usually accompanied by rough running.

MULTIPLE CARBURETTORS

Multiple carburettors (all types)

1. Disconnect the cold start cable and linkage or make sure that the switch for the auxiliary carburettor is in the "off" position.
2. Screw the jet adjusting nuts or screws on all carburettors so that the jet is flush with the carburettor bridge or, if this cannot be attained, to its highest position.
3. Turn down the jet nuts or screws on all carburettors two full turns (Type HD two and a half turns).
4. Slacken one of the clamp bolts on the throttle inter-connection shaft. Start the engine and adjust the throttle adjusting screw on each carburettor so the engine is idling speed is set at the manufacturer's specifications.
5. Check all the throttle valves are open an equal amount. The simplest method to carry out this test is with a short length of rubber tube, one end held to the ear, the other placed in turn at the corresponding place in mouth of each carburettor. Adjust the appropriate throttle valve screw until the amount of hiss is equal on all carburettors.
6. Turn the jet adjusting nut or screw either up or down on each carburettor until the fastest and most even running of the engine is obtained. Turn the nut or screw upwards to weaken the mixture and vice versa.
7. Check the mixture strength by lifting the piston approx. 1/32". If the mixture is correct on that carburettor the

engine speeds up considerably, the mixture on that carburettor is too rich. If the speed decreases, the mixture is
too lean. Repeat this operation on all carburettors.

8. Tighten the clamp on the throttle interconnecting shaft.

After the carburettors have been tuned, connect the cold start cable so that it has approx. 1/16" free travel before it starts to move the jet lever. Pull out the control knob until the free travel is taken up and any further movement would move the jet lever. In this position adjust the fast idle screw to give an engine speed of approx. 1,000 R.P.M. Push the control cable right in and ensure that there is clearance between the fast idle screw and the throttle stop. If no clearance, the free travel of the cable must be reset.

The final step is to fill the hydraulic damper to the correct level with S.A.E. 20 Oil. If the damper cap has a vent hole drilled through it, the correct oil level is ½" above the hollow piston rod. If there is no vent hole in the damper cap the level is ½" below the piston rod.