OPERATING AND SERVICING INSTRUCTIONS

TUSON'S

"OFFICIAL"

GAS PRODUCER

TUSON'S PTY. LTD.

[illegible] ALLIS HOUSE
MARTIN PLACE
SYDNEY

BUY FROM YOUR NEAREST FORD DEALER

William A. Cooney, Printer, 72 Liverpool St., Sydney

TUSON'S
"Official" Gas Producer

FUEL.—Fill the hopper with **clean** charcoal graded between the sizes of ¼ minimum and 1¼ maximum. The most satisfactory operation is obtained with the hardest charcoal, provided it is well graded. Pack the charcoal down with a light bar.

WATER.—See that the water tank is filled to within 1" or 2" of the top with clean water. A four-gallon tank should have ample capacity for 200 miles in the hottest conditions.

IMPORTANT.—The return water pipe extends several inches inside the water tank (this can be felt with a wire), and this pipe **must** be connected to the **top** pipe of the Tuyere. Keep the water tank filled above indicator tap. Do not risk running out of water. Burnt out Tuyeres are costly to replace.

If you do run dry, before filling water tank, **be sure** to let Tuyere **cool off** or it will crack.

SEALING.—Before the producer is started, see that all lids and doors on the generator and cleaners are properly closed and screwed down. Use graphite, not grease, on lid packings.

STARTING.— (See also "MIXING VALVE," page 5.)

Light a wick of kerosene on asbestos and start the engine on petrol. The wick should be held slightly below the Tuyere and clear of it. With the engine idling fast on petrol, pull out change-over control until engine begins to slow down. This opens butterfly F, causing a suction in the gas line which draws up the fire. (Air control should be right out so as to throw the maximum suction on the gas line). As soon as the charcoal ignites, extinguish the wick. The vehicle can then be driven off on petrol, and change-over made whilst running, or the change-over can be completed before starting, and the vehicle driven off on gas. Until a driver becomes thoroughly familiar with manipulation of the controls, it is probably better to get the engine running properly on gas and the air control correctly adjusted before driving off.

As soon as the engine is running on gas, adjust air control for best results, and alter the adjustment as the fire draws up. More air will be required as the fire increases until it reaches its maximum heat.

TUNING & DRIVING.—In order that the best performance may be gained from gas, it is desirable to set the choke when the fire is well heated. This is best done in first or second gear by finding the setting which gives the maximum speed. If the equipment is run entirely as a Producer Gas Truck, no hand adjustment of the spark is required as this can be permanently advanced, but if a petrol-producer gas combination is to be used, it is desirable to supply a hand spark control and to retard the spark slightly when petrol is being used. Driving a Unit on Producer Gas should not differ from driving on petrol except that more frequent gear changing will be necessary. Remember that Producer Gas gives only about 60 per cent. of petrol power, so use your gears. Keep the revs up in heavy going.

When coasting down hill, if there is a climb ahead, have your engine idling fast enough to keep your fire drawing well, otherwise you will be short of gas just when you need it most.

REFUELLING.—The range of the hopper varies according to vehicle and conditions. The 4ft. hopper has a total capacity of about three 56lb. bags, and the 3ft. hopper about two 56lb. bags, but the **effective** capacities are from ½ to ¾ of a bag less.

It is advisable to refuel before charcoal gets too low, otherwise a decided falling off of power will be experienced.

When opening the hopper for refuelling or at any time when the generator is full of gas, operators are warned that the gas is almost certain to ignite, and may cause considerable discomfort if the operator's face is too close to the opening. The flames are too short-lived to be dangerous.

The best method of avoiding inconvenience is to stand well back and throw a lighted match into the generator immediately the top is opened, so that all the accumulated gas will be burnt. In refuelling it is desirable to pack down the fuel as for the original charge, and it is important to see that the lid goes back properly into place, and is well tightened down.

SAFETY FIRST.—Drivers of hinged car units should always remember the additional weight overhanging at the rear, and **CORNER CAREFULLY,** particularly on slippery or gravelly surfaces. A tail skid is obviously more likely with all this added weight behind the back axle.

INSURANCE.—Upon fitting a gas producer to a motor vehicle which is insured, the Company should immediately be notified.

With most Insurance Companies, the position at the moment is that the insurance remains unaffected except that when a motor vehicle is equipped with gas producer plant, the total liability of the Company under the third party Sections of the Policy is limited to £1,000 in respect of death, bodily injury and damage to property, caused by or in consequence of, or arising directly or indirectly out of fire. This limit may be increased as follows if desired:—

Additional	£1,000	Extra Premium . .	20/–
Additional	£2,000	Extra Premium . .	30/–

The Underwriters' Association is at the present time giving consideration to the extra premiums to be charged for extension of a Policy to permit the use of Gas Producer Plant, or to insure the plant.

IMPROVING PERFORMANCE ON GAS

SPARK.—As Producer Gas burns much slower than petrol gas, it is essential that spark shall be considerably advanced. The exact angle of advance will vary with different makes of engine, and can only be determined by practice.

COMPRESSION.—A much better performance can usually be obtained from Producer Gas by boosting the compression of the engine. This can be effected by modifications to the cylinder head or the pistons, increasing the compression ratio to as high as 8:1, provided it is not intended to revert to petrol again at a future date. Special spark plugs may have to be fitted, as some makes will not stand such high compression.

VALVE CLEARANCE.—As Producer Gas burns cooler than petrol gas, it is usually possible to reduce the exhaust valve clearance to about three-quarters of that recommended by the makers of the engine. Some engines show a noticeable improvement after this adjustment.

HOT SPOT.—The cooler the gas, the greater the power, hence it is most desirable to block out the hot spot if this is at all possible. And above all, never forget **the** most important thing about Producer Gas, namely,

DO NOT BREATHE THE GAS !

CAUTION.—If Units up to Serial No. 600 are to be used in dry crops, or long dry grass, the flame trap should be altered, or a later model flame trap fitted.

ALWAYS AVOID BREATHING THE GAS

NEVER RUN ON GAS IN A CLOSED GARAGE.

EMPTYING CLEANERS.—With reasonably good charcoal the First Cyclone Cleaner has a range of 200 miles, the Second Cyclone, 500 miles, and the Wool Cleaner, 200 miles. The safest method is to empty all three cleaners at intervals of not more than 200 miles.

WOOL DUSTERS.—Dusters must be the right size, well made and **dense** so that they fill the tubes tightly. **Every** duster must be doing its job. If one gets dirty towards the top before the others do, it is not dense enough, and should be replaced. Bent sticks will cause dusters to fit badly and let dust through. Shake new dusters out a couple of times in the first 150 or 200 miles. They are not at their best until used a while.

It is **most important** that duster sticks should be just the right length. If too long, the stick will bend when the lid is tightened. If too short, the duster may drop after 100 miles or so. By this time it has more or less set to the taper of the tube, and will be a loose fit when it drops, hence the dust will pass up the outside. Every effort is made to ensure that sticks are cut the exact length —about $\frac{1}{4}$" off the lid when pushed right up—but if you get a short duster, either lengthen the stick with a piece of conduit or only push the duster up far enough to allow it to be resting on the lip when closed. It is a good practice when replacing dusters after cleaning to push them up not quite to the level of the lid, then the lid will push them home when tightened and you will know that all your dusters are actually resting on the lid and it will not be possible for any of them to drop.

Always fluff the wool out well when cleaning dusters. If you don't get a range with good charcoal of from 250 to 600 miles (according to vehicle and conditions) look for some simple and easily remedied fault. The life of dusters is anything from 2,000 to 6,000 miles, but they should be replaced when they are no longer a tight fit in the tube.

If moisture (caused through using wet charcoal) reaches the wool dusters, drain both Cyclones and bottom of Final Cleaner. Get rid of the moisture, and allow the flow of dry gas to dry out the dusters. Do not remove them until dry.

CLEANING GENERATOR.—The intervals between generator cleanings will vary considerably according to the fuel and the road surface. With good charcoal giving no clinker, and good road

surfaces, the hopper need only be cleaned at intervals of about 1,000 miles. With poor charcoal containing an excess of earthy material, clinker formation may necessitate cleaning the hopper after 100 miles, and excessively rough road will cause a large accumulation of dust in the bottom of the generator, which has to be removed because of its high resistance to gas flow. This matter is, therefore, largely one of experience and care in selecting fuel. It is reasonable to expect mileages of 500 miles without any attention to the generator, if good fuel is used, but if dusty charcoal is used, much more frequent cleaning will be necessary. Neglect of cleaning when dusty fuel is being used might result in the accumulation of dust lifting the grate so that it will bump off its hooks. If this happens, the Cyclones will continue to choke up until hopper is cleaned and grate replaced.

CLEANING PIPE LINES.—At mileages of approximately 5,000, it is advisable to examine the pipe lines and internal surfaces of the cleaners, cooler, etc., to see that there is no accumulation of soot and to remove this, if necessary.

THE MIXING VALVE.—The Mixing Valve comprises two parts bolted together, namely: The gas inlet elbow, on which is mounted the semi-automatic air inlet and the gas section of the change-over valve; the manifold adapter, which includes the foot accelerator butterfly and petrol section of the change-over valve. (There are two types of adapters: the universal type, which is single bore and is fitted with round flanges to be drilled as required to fit the manifold studs and to take the carburetter; the Ford, or two-bore type, specially designed for Ford **V8** engines.)

Fig. 1 is a simplified sketch of the essential components of the valve. Flange A is bolted to the engine manifold. The carburetter is bolted to flange B. A by-pass pipe is fitted from the existing air cleaner to inlet C, or alternatively a separate air cleaner is fitted. The gas line is connected to the gas inlet D.

It is essential that the air inlet C is mounted vertically, as shown in Fig. 1. If it is mounted horizontally, or totally inverted, the action of the offset butterfly E will be upset and the valve will not work.

The air valve control (Bowden control mounted on the dash) is connected to the arm M, which is a loose fit on the shaft. The spring lever N is fastened to the shaft. The hand throttle (may have to be supplied as many modern vehicles are not fitted with hand throttles) is connected to the carburetter. The foot accelerator is connected to the crank on butterfly spindle H. The butterflies G and F are connected with a link and adjusted at the factory so that they open and close alternately. If they become out of adjustment, one must be closed while the other is set full open,

REGISTRATION.—Upon fitting a gas producer to a motor vehicle, proceed as follows:—

(1) Have the vehicle, whilst fitted with equipment, weighed upon a railway or registered public weighbridge.

(2) Forward the weighbridge ticket to the Road Transport Branch, together with the current certificate of registration, information concerning the make of the equipment, and the date on which it was fitted.

(3) Complete a form of declaration, obtainable from the Road Transport Branch, regarding the use of the equipment, and return it with the abovementioned documents and information.

Where a motor vehicle is at all times or at some time propelled wholly or partly by Producer Gas generated by equipment carried on the vehicle, the weight of the vehicle for taxation purposes is reduced by—

6 cwt., where the unladen weight of the vehicle, inclusive of such equipment, does not exceed three tons;

8 cwt., where such weight exceeds three but does not exceed six tons;

10 cwt., where such weight exceeds six tons.

Where the gas for the propulsion of a vehicle is generated by equipment fitted to a trailer, the trailer is required to be registered, but provided it is not used for any other purpose, complete exemption from the payment of registration fee, tax and goods motor vehicle licence fee is granted.

The appropriate procedure to adopt to effect registration is shown hereunder:—

(a) If the trailer is constructed of second-hand materials, the vehicle to be inspected at an Authorised Inspection Station and a certificate of fitness obtained.

(b) The trailer, whilst fitted with the equipment, to be weighed upon a railway or public registered weighbridge, and

(c) The trailer, together with the certificate of fitness (if necessary) and weighbridge ticket, to be submitted to a Motor Registry and application made for registration.

In those cases where exemption from the payment of fees and tax is granted the registered owner is required to complete a form of declaration (obtainable from the Road Transport Branch).

TAR.—The appearance of tar on the Security Filter is always entirely due to incompletely burnt charcoal. It cannot be removed in the cleaning system and must be remedied at its source by using correctly prepared fuel.

CLINKER.—The amount of clinker formed from the ash in charcoal is negligible, and any excessive clinker is due to earthy impurities in the charcoal. This too, must be remedied at its source by using clean fuel.

GENERAL.—After a good run, if your engine will not start up on gas after a 20-minute stop, look for air leaks.

After 2 or 3 hours' stop, there is usually no need to use the kerosene wick. Start your engine on petrol, open the change-over a little, and see if the fire draws up.

TROUBLES.—Don't blame Producer Gas for all troubles. The first thing to do is see if your vehicle will function normally on petrol. If so, look for the trouble in the gas.

The most common cause of trouble is air leaks. When refuelling and cleaning, always see that packing washers are free from dirt before tightening lids.

To locate an air leak, put some straw, shavings or oily paper in the hopper, set fire to it, and when properly alight screw the lid down, and examine the hopper, cleaners and pipe line for escaping smoke.

An arched fire causes a falling off of power. (This is more likely to occur on a smooth than a rough road.) Remedy, raise the hopper lid and poke down towards the Tuyere with a long poker. If the fire arches after driving for some time on a smooth road, it can sometimes be remedied by running over a few ruts.

Poor charcoal always causes trouble of some kind—usually loss of power or excessive clinker. Always use clean graded charcoal, specially prepared for producer gas by a reliable source.

A rapid fall in power is usually a sign that the fuel is getting low. A gradual falling off usually indicates that the cleaning system needs attention. Watch the Security Filter, particularly when very new or very old dusters are being used in the Final Cleaner.

Don't let your charcoal get wet. Though a certain amount of moisture is of some benefit, too much will cause a great deal of trouble.

Keep your controls in good order, and see that Bowdens are kept adjusted so that butterflies open properly and close completely. If closing is not positive, connect a light spring from the crank to a convenient anchorage to assist the closing. Try control cranks occasionally to see that they are not loose on their spindles.

then while this one is closing the other will automatically be opening. If the need arises to readjust butterflies, make sure to have them closing with the bevel in the right direction. One of the cranks is drilled to take a Bowden wire. This Bowden is the other control mounted on the dash, and care must be taken to see that it is positive in action and that there is no spring in the Bowden. It is important that the butterflies are closed completely on the extreme limits of Bowden operation.

To operate the controls, set the change-over control (operating butterflies F & G) so that the butterfly F is closed (G open). The

OFFICIAL MIXING VALVE

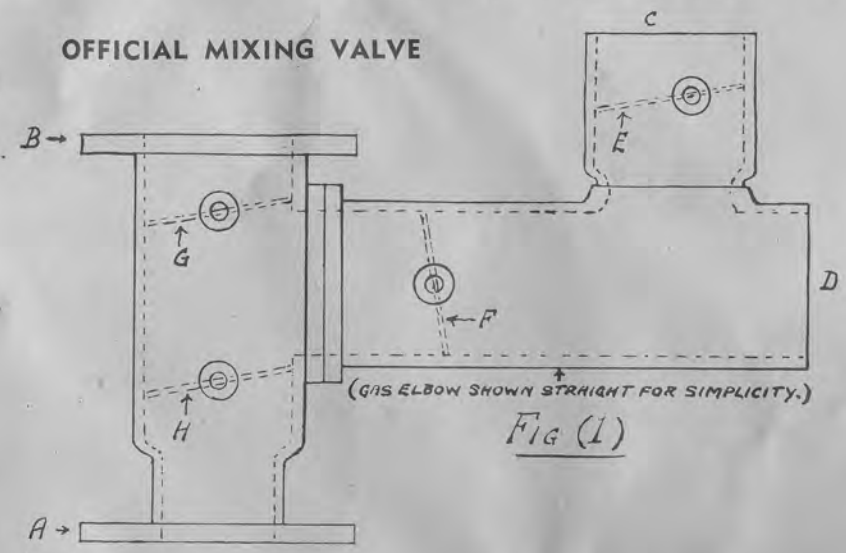

FIG (1)

hand throttle is set about half open and the engine started in the ordinary way, using the foot accelerator and choke (if necessary). The Producer is then lit and the driving position resumed. The engine is revved slightly and the change-over control moved so as to open the valve F enough to draw the fire and begin to make gas. As the engine begins to fire smoothly, the air valve E is opened at the same time as the change-over control is moved so as to completely open the butterfly F. When the engine is running completely on gas the air valve E is set for best results whilst engine is idling. When the motor is speeded up the suction of the engine draws the butterfly E open against the spring O. To such an extent is the air valve automatic.

When the engine is on gas the hand throttle control on the carburetter can be closed.

NOTE.—On Ford **V8's** it is considered advisable to have a remote control on (or near) the dash to the petrol line, so that the driver

can turn the petrol off when he gets the motor running properly on gas. On single bore jobs, if the carburetter throttle is adjusted to close completely (and there is no idling vent by-passing the throttle), and the change-over butterfly G closes tightly, there is no need to turn petrol off upon changing over to gas. It is safer, however, to make provision for the driver to turn off the petrol on any make of vehicle, as quite a lot of petrol can be used on a long run if it happens that butterfly G is not firmly closed by its Bowden control.

The only adjustments on the Mixing Valve are the idling adjustment on the accelerator spindle H, and the spring adjusting screw P, which is correctly set at the factory. This only needs adjusting if the spring O is distorted. The only service it needs is oiling and keeping all screws tight.

"BOOSTING" WITH PETROL.—If it is desired to "boost" with petrol on a hill, as soon as the vehicle commences to slow down proceed as follows: Keeping the foot on the accelerator, open the carburetter throttle with the hand control, then pull the change-over control out from a quarter to half way, according to the amount of petrol it is desired to use. (Of course the petrol will

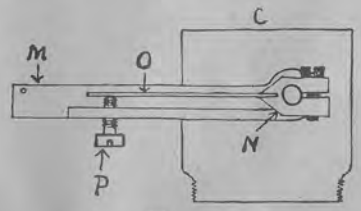

Fig. 2

need to be turned on before this is done). The spark will need to be retarded as the proportion of petrol is increased, and the air adjustment altered to suit the petrol-gas mixture. No rule can be laid down for altering air adjustment to suit "boosting." This will depend on carburetter adjustment, and can only be determined by experiment.

Do not pull change-over control out too far when "boosting," or butterfly F will close to such an extent that there is not sufficient draw to keep the fire up; furthermore, you will be using nearly all petrol and very little gas.

THE SECURITY FILTER.—The Security Filter is usually fitted under the bonnet as near the gas inlet of the Mixing Valve as possible, with the flanged end towards the Mixing Valve. If the Filter is fitted the opposite way, maximum efficiency will not be obtained owing to a restricted area of felt exposed to gas entry.

As modern engines are mostly rubber mounted, it is advisable to fasten the Security Filter to the frame by rubber mounting, and connect it to the Mixing Valve with a sufficient length of rubber hose to take care of the play.

To service the Security Filter, remove from the car and then open up. When the internal tube is removed from the case, remove the wing nut and retaining plate and then slide the felt washers from the perforated tube. If they are dirty, wash them thoroughly in water and they should resume their original dark blue colour. They can then be dried and replaced. If washing fails to renovate them they are impregnated with tarry products from poor quality fuel and must be replaced. When replacing or renewing it is important to see that they are tightly packed together (especially as new felts shrink) and that the gasket is a good fit.

IMPORTANT.—Six spare felt washers are supplied with each new security filter to provide for shrinkage of new felts. Whereas about 22 washers are fitted when new, it will be found that one or two more can be fitted each time the filter is cleaned for the first two or three times. After each clean, pack all the additional washers on that will fit. Always keep the felts packed tight.

NEW TYPE SECURITY FILTER. (Incorporated in Final Cleaner).

DO NOT WASH THE FELT.—The makers of the felt state that preshrinking is impracticable, and advise to clean by beating. If the felt is damp when removed, give it a good beating and replace straight away. It will shrink if dried in the sun, but not if replaced and clamped tight whilst still damp. Be sure to replace felt the same side up as first fitted. The underneath side will become impregnated with dust to a certain depth, all of which may not be removed on cleaning, and some of this dust might be drawn into the engine if the felt is reversed.

SPARES.—It is desirable that owners should always have on hand a spare packing for each size of lid, so that a faulty joint can quickly be repaired. Evidence of faulty joints on the producer is signified by excessive local heating; thus if the lid is not sealed properly the whole of the top of the generator will become heated, and if the bottom door should leak, a local fire will be apparent in the over-heating of the surrounding casing, and neglect of the latter can cause serious damage to the hopper.

SPARE WOOL DUSTERS.—These should also be stocked, as they have a useful life of from about 2,000 to 6,000 miles and should be replaced when they become excessively matted and irregular.