Triumph Roadster oil filters (Part I) by Paul Alting van Geusau

The Triumph Roadster 1800 and 2000 both have oil filters with replaceable oil filter elements. Obtaining these filter elements for, in particular the 1800 felt filter element, has become more difficult now that Tony Butterfield retired. With some effort it is still possible to find suitable cartridges but for how long that will be the case, nobody knows. However, adapters are available for the Roadster 2000 to use readily available spin-on cartridges and a similar adapter can be manufactured for the Roadster 1800.

In Part I we will first have a look at the oil filter development in general and for the 2000 in particular. As concerns the 2000 reference can be made to the Standard Vanguard Service Instruction Manual of which four pages showing the development of the filters are attached to this article.
In Part II the adapters for using spin-on oil filter elements on both the 1800 and 2000 are discussed with some suggestions for improvement and a suggestion for modification of the Fram filter head to become a full-flow type of filter head.

First some oil filtering basics
Early automotive engine designs did not use any oil filtration mainly because of the total-loss lubrication system not having a pressurised lubrication. Moreover oil was changed every 500 to 2,000 miles and such early engines burned and leaked enough oil during normal operation that almost constant replenishment with new oil was necessary. The development of pressure lubrication brought about a need for some type of filtration to protect the oil pump and engine from supply with dirt in the lubricating oil. Initially only simple wire meshes or screens were used in the oil pump intake. A better filter was invented by Ernest Sweetland and George Greenhalgh in 1923, and they named the new product "*Purolator*" - a combination of the words: "PURE OIL LATER" (the company Purolator still exists).

This was a so-called “by-pass” filter, by-pass because it was situated in a line parallel to the main stream of the oil coming from the oil pump which flowed directly from the oil pan to the engine's working parts, while in the parallel line a smaller proportion of the oil (about 10%) was sent through the filter back to the oil pan. The oil was thus filtered over time so as to keep it clean. These bypass filters were an improvement but they were not very effective, in particular not in case of oil contamination by sand an dust entering the engine through the inlet tract and passing by the pistons. During WWII when these problems became obvious, a new type of oil filter was developed and introduced: the “full flow” type in which all the oil from the oil pump passes through the filter and then to the parts to be lubricated. The first use of a full flow oil filter on mass production vehicles occurred in 1946 and in so far the Triumph Roadster 1800 is one of those first cars with a full flow type of oil filter (Tecalemit filter)!

You may ask now why full flow oil filters were not used from the start because it appears obvious that for optimal engine protection all the oil supplied to the moving parts should be filtered. However it is not that simple to ensure lubrication when all the oil has to pass a filter, in particular in those early days of motor transport.

Today, in-line oil filtration filters oil down to about 30-40 Micros (millionth of a meter). Smaller pores would cause too great a pressure drop when the oil is cold or the filter partially plugged, forcing open the filter by-pass valve and allowing unfiltered oil to enter the engine. In the early days with straight lubricating oil, instead of the now used low viscosity multigrade oils, together with the simple materials used for the filter, effective filtering and at the same time allowing sufficient flow rate could not be achieved.
In contrast to the full-flow type of filter the by-pass filter does not influence free flow of lubricant to the engine parts and the pressure drop over the filter can be high so that a filter element with small pores can be used.
It is interesting to note that the designers of the Vanguard engine adopted by the Triumph Roadster 2000, went back to the by-pass system (see the attached pages of the Standard Vanguard Service Instruction Manual) and only with the appearance of the Triumph TR3, a full flow filter was reintroduced. Apparently there was a risk of clogging when using a felt filter element and it is reported that quite some experiments were carried out to develop a by-pass filter with the capacity that the complete sump was filtered 1 ½ times in an hour at normal working temperature.
However, with improvement of oil and filter materials during the 1950' most of the car manufacturers turned to full-flow filters, which thus became the standard for many years to come. Somewhat later the exchangeable filter elements were abandoned in favour of spin-on type filter elements. But, newer developments go back to the renewable filter elements because of waste reduction and safety considerations. The spin-on filter relies on a rubber seal pressed against a flat sealing surface by screwing it on the filter head. In case the filter is not mounted correctly all the lubricating oil is spilled into the environment before the engine seizes.

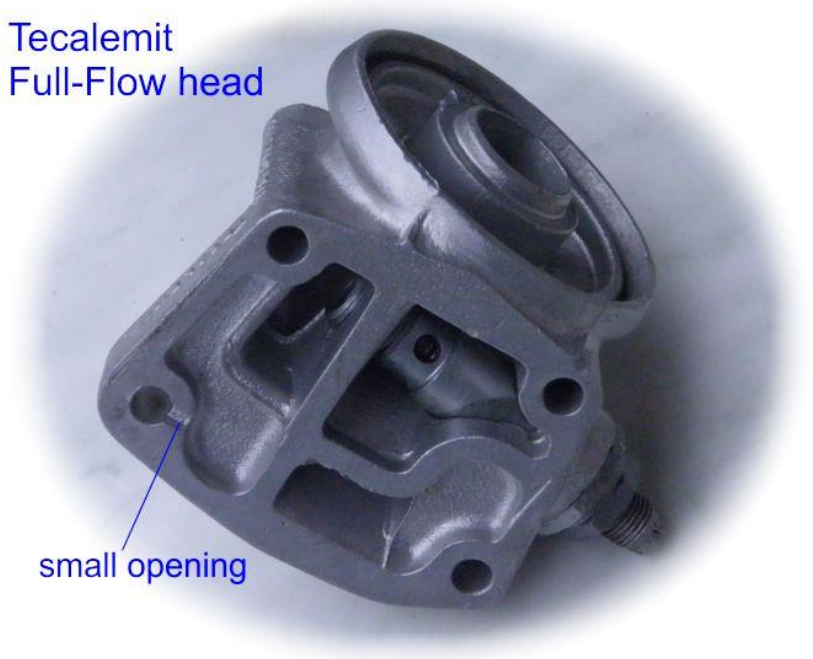
Only with the very high life expectancy of modern engines and very high oil change intervals, in particular when trucks are concerned, the advantages of the by-pass filter have been rediscovered. While in full-flow filters, cellulose media can filter up to 30 µm without too much a drop in oil pressure, the average size of wear particles in engines is in the range of 5 to 30 µm. These can be filtered out with a by-pass filter thereby improving the overall cleanliness of the oil without compromising the flow rate to the engine. Not only do the by-pass filtration units cleanse the sump oil of blow-by and oxidation products, they also reduce wear by metals and silicon accumulations, both of which are abrasive. For maximum life expectancy a full-flow and by-pass filter are used in combination nowadays and allow never heard of oil change intervals of 250.000 km and more.

An interesting by-pass filter introduced late in the 1950' is the so called "toilet paper filter" (see http://www.frantzoil.com/home.html), which is an aftermarket by-pass filter in which the filter element is a roll of toilet paper!

The Standard Vanguard Instruction Manual pages
These pages give a detailed description of the development of oil filters for the Standard Vanguard engine. Interesting to see that initially the Tecalemit 1800 filter design was continued but soon a by-pass filter was adopted. Important to note that a full-flow filter always has a by-pas valve, which opens in case the filter element gets plugged. Nowadays the by-pass valve is mostly integrated in the spin-on filter element.
It further shows the importance of the combination filter element-restrictor, so ideally the Fram filter head (restrictor orifice less than 1mm) should be used with a Fram C.800

cartridge and the Purolator head (restrictor orifice 2.4mm) with a “Micronic” element. This makes life complicated but experience teaches that as long as a by-pass cartridge is used both the Fram and Purolator work well.
It is also stated that by-pass cartridges should not be used in full-flow filters and vice-versa. We know why: in comparison to a full-flow filter a by-pass filter has high resistance to flow and when used in a full-flow filter head would have the effect of a plugged full-flow filter and lead to constant opening of the bypass valve and no filtering at all. Use of a full-flow filter element in a by-pass filter might have an oil pressure decrease (in particular in case of the Purolator head with its 2.4mm restrictor) because the restrictor is then the only flow limiting item instead of the combination of filter element and restrictor.
Conversion to a spin-on filter for the Fram and Purolator heads proved more difficult than for the full-flow Telecamit head because few spin-on by-pass filters are available and usually they have a different fixing screw thread when compared to the full-flow spin-on filters. More about spin-on conversions in part II.

Oil circulating “knock”
A further interesting point is addressed under the heading “oil circulation knock”, a phenomenon perhaps not unknown to Roadster 2000 owners**.**
Apparently the “knocking” noise is caused by the rotating camshaft which at each revolution gives free a bore in the rear-end camshaft bearing for oil supply to the rocker shaft. This leads to a pulsating oil pressure at the take-off for the oil pressure gauge.
The modification concerns a modified take-off point for the oil pressure gauge. In the picture below you see a small opening allowing the oil pressure at the inlet of the filter head to be to be taken off by means of a banjo connection at the outside of the filter housing. So with this modification the pressure before the filter is measured and not any longer the pressure in the oil gallery.



OIL FILTER ASSEMBLY

Very early Models of the Vanguard employed the Tecalemit Oil Filter Assembly, this Assembly, however, was replaced fairly early in production by the Fram Oil Cleaner which has now, in turn, been replaced by the Purolator Micromic Filter. Details for all three of these arrangements are given in this Manual. (See also Page 50.)

TECALEMIT OIL FILTER (Eng. No. V1E—V311E)

Description (see Fig. 35).

A slightly different form of this filter has been used for some years on various of our models and an understanding of the operation of these will cover the present assembly.

As already described under "Lubrication," oil is forced from the annular space around the oil pump driving shaft, through the filter assembly. The oil entering the filter assembly passes first over the relief valve orifice. This relief valve regulates the oil pressure and when a pressure of 60 lbs. per square inch is exceeded, the ball leaves its seating and oil is returned to the sump unfiltered until the pressure has dropped appropriately.

The delivery of oil from the pump will increase with engine speed. At high engine speeds the engine bearings will not require the total output of the pump and thus cause back-pressure, which is of sufficient magnitude to operate the release valve, returning surplus oil to the engine sump. The bulk of the oil passes under pressure to the outside of the filter element, which is located in a detachable container.

By the design of the cleaner, the oil has to enter the element from its periphery, being forced through the felt material of which it is composed, and leaving sludge on its outer surface. The clean oil passes up the centre of the element, passing round the annular space between centre bolt and bracket, finally leaving by a hole, which is matched by another in the cylinder block, which leads to the main oil gallery.

A spring-loaded balance valve is provided on the underside of the bracket above the element, which is subject to the full pressure of the oil entering the cleaner from the engine. The slightly lower pressure of the clean oil passing out of the filter element acts on the other side of the valve and assists the spring to keep the valve on its seating, resisting the pressure of the oil as it enters the cleaner prior to being filtered. Thus all oil passing to the engine is forced through the element so long as this is not clogged with dirt.

After some thousands of miles the filter becomes clogged with dirt, thereby decreasing its porosity and increasing the pressure required to

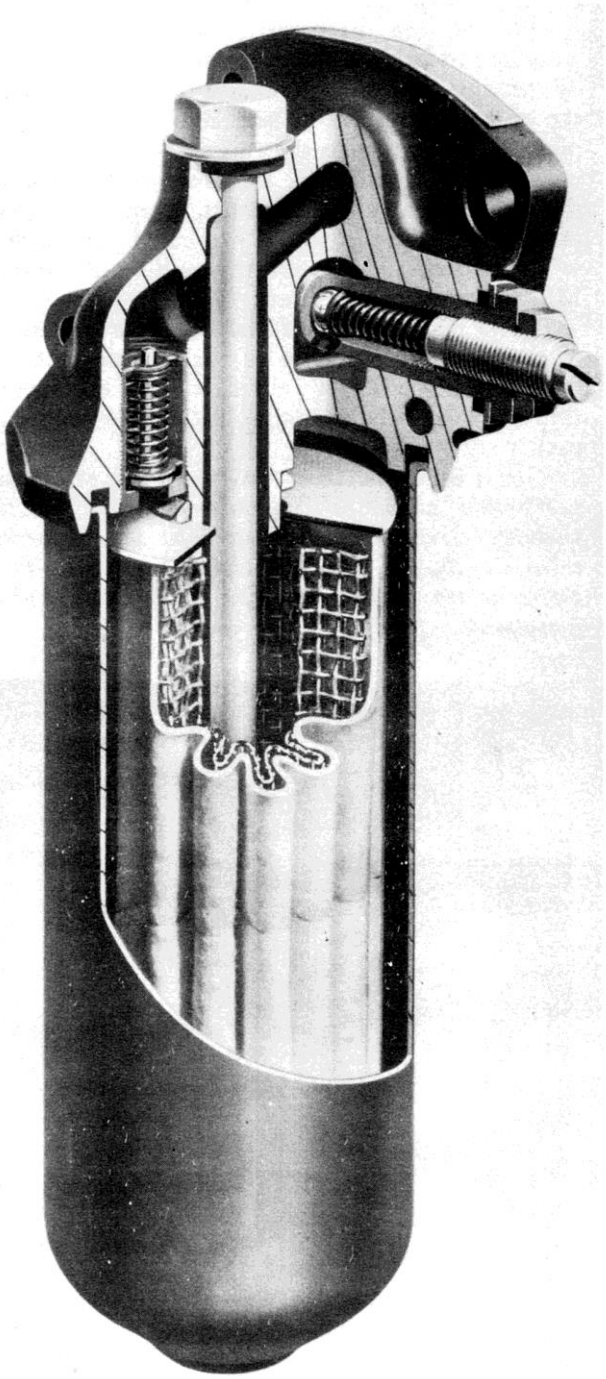


Fig. 35. Tecalemit filter employed on early models

force oil through it. The result of this decrease in porosity is the lowering of the pressure of the filtered oil.

With the progressive drop in pressure of the filtered oil a point is finally reached where the combined resistance offered by the by-pass valve spring and the oil leaving the element is insufficient to balance the pressure of the incoming oil bearing on the bottom face of the valve, and the valve is lifted off its seat, allowing unfiltered oil to be fed direct to the engine.

As can be seen from the previous paragraph, the balance valve ensures that, even where the changing of the element is neglected, the engine will get some oil although this will be unfiltered.

Maintenance of oil filter.

The maintenance of the oil filter is limited to the periodic checking of the tightness of the four securing bolts, the elimination of leakages if they occur and the changing of the filter cartridge each 10,000 miles.

It is important when removing the filter bracket and packing washer for any reason to ensure that the packing is refitted so that oil holes are in correct relation to those in cylinder block (see Fig. 36). With the latest type of packing shown the correct assembly is foolproof. (See also Page 50.)

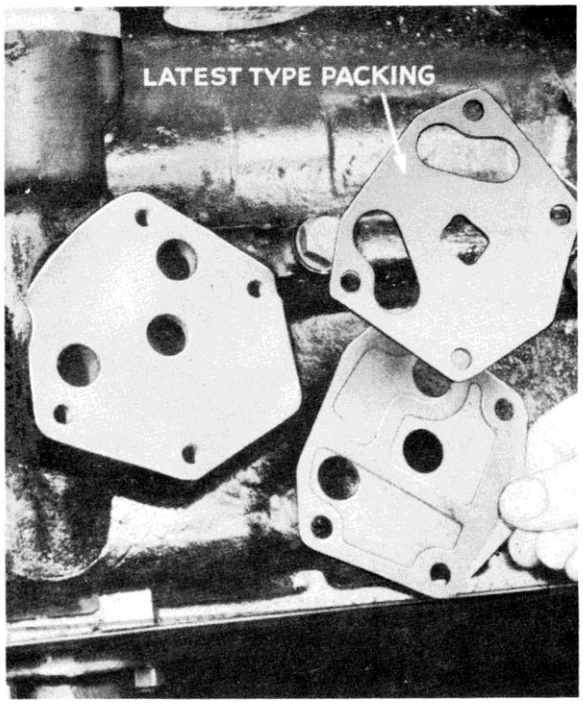


Fig. 36. Correct fitting position for oil cleaner packing washer. The latest type of packing the fitting of which is fool-proof, is inset

FRAM OIL AND ENGINE CLEANER—TYPE FHMS.800 (Eng. No. V312E—V89332E. Less V89283E—V89294E)

Description.

The Fram oil cleaner differs from the Tecalemit in that it is of the by-pass type. It is necessary to understand clearly the precise meaning of the word " by-pass." The cleaner is provided with a restrictor by-pass which is shown in Fig. 37, and is so arranged as to control the quantity of oil actually filtered. The reason for restricting the oil is to ensure that the oil which is actually filtered is cleaned thoroughly and also that the pressure drop in the filtered oil is not too great. The restriction, however, is so arranged that the complete sump is filtered 1½ times in an hour at normal working temperature and a pressure of 60 lbs. per square inch. In this way all the oil in the system is preserved in a thoroughly clean condition.

The selection of size for the restrictor was only made after numerous experiments, which were carried out with a view to obtaining the best possible results on actual engines.

The cleaner contains a removable cartridge element, which is filled with filtering media consisting of closely packed cotton yarn treated with triethanolomene, which latter substance increases the absorbing qualities of the fabric material contained by the element.

From Fig. 37 it will be observed that the oil pressure release valve is contained in the filter bracket casting. The valve is of the spring loaded ball type and is adjusted to blow off at 60 lbs. per square inch.

The operation of the cleaner is as follows :—

All the oil from the annular space around the pump drive shaft (see previous remarks on lubrication) enters at the " inlet " gallery, and as long as the pressure of the oil is below 60 lbs. per square inch, a quantity of this oil flows around the container and leaves the cleaner assembly via the " outlet " gallery, which can be clearly seen in Fig. 37. A proportion of this oil, however, flows through the cleaner and is admitted to the " sump " gallery through the restrictor. When the speed of the engine is such as to deliver oil at a higher pressure than 60 lbs. per square inch, the release valve opens and a certain amount of oil is delivered to the sump through the same port as the filtered oil. The amount of oil so delivered is naturally a function of the pump delivery pressure.

The cleaner is capable of withstanding very high pressure without leaks, and tests have

shown that a hydraulic pressure of 600 to 800 lbs. per square inch is required before leakage occurs. The main gasket is located in a recess so arranged that when the body is forced into this recess by the centre bolt, the gasket is fully trapped, thus ensuring a very efficient joint.

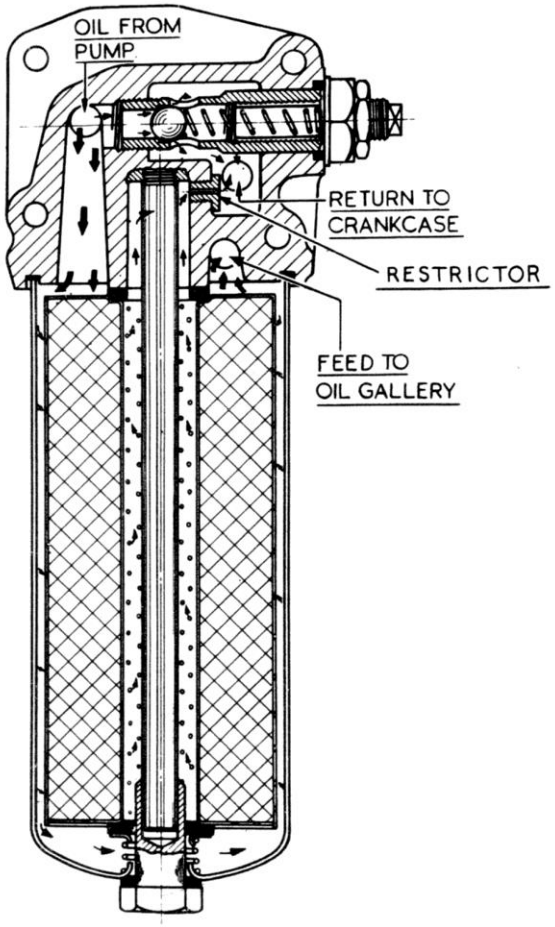


Fig. 37. Diagrammatic section of Fram filter

Maintenance attentions.

Under normal conditions, it has been found that the cartridge will efficiently clean the oil for a mileage of between 6,000 and 8,000. It should be understood that this figure is an arbitrary one and that the element need only be changed when the oil becomes dirty. Our normal recommendation for change of cartridge is 10,000 miles. When changing the element the following procedure is recommended :—

1. Unscrew centre bolt at bottom of container to free it from bracket casting.
2. Extract cartridge with top and bottom sealing washers.
3. Remove spring and centre bolt and wipe out cleaner body with a piece of fluffless cloth. Renew centre bolt gasket (provided in carton with new cartridge). Refit centre bolt and spring.
4. Fit new cartridge, ensuring that top sealing washer is fitting snugly in recess provided in top casting and also see that bottom sealing washer is seated correctly. (Top of cartridge can be identified by transfer.)
5. Refit body to bracket casting. Tighten centre bolt, ensuring that body locates squarely in cover casting and that centre bolt gasket is fitting snugly in recess provided.
6. Ensure that joints are oiltight by running engine for five minutes.

Particular care should be taken to ensure the maintenance of an oiltight fit between the cleaner body and cover casting.

It is scarcely necessary to point out the necessity for absolute cleanliness when changing the cartridge. The cleaner body should be carefully inspected, and the various joint faces cleaned before inserting the cartridge in the container.

It is important that only the Fram C.800 cartridge should be used, and on no account should a Tecalemit replacement element be fitted to this cleaner. The cleaner under consideration is of the by-pass type, whilst the Tecalemit is of the full-flow variety and the use of an element intended for the latter type would cause an excessive drop in pressure and result in no oil cleaning whatever.

It is important to appreciate that top and bottom sealing washers shown in Fig. 37 are of vital importance to the efficient working of the cleaner. If either of these two washers are faulty they should, of course, be changed. It will be seen from Fig. 37 that if either of the washers is faulty, oil could conceivably reach the sump without being filtered.

When the used cartridge is removed, it will be saturated with oil and as removal will result in the loss of approximately one pint, the sump should be correspondingly topped up with new oil. It is recommended, however, that the engine oil should be renewed at the same time as a new cartridge is fitted and hence the topping up process becomes automatic.

WHEN REMOVING FILTER BRACKET AND PACKING FOR ANY REASON, ENSURE CORRECT RELATION OF OIL

HOLES IN PACKING WITH THOSE IN CYLINDER BLOCK (SEE FIG. 36). WITH LATER PACKINGS CORRECT ASSEMBLY IS AUTOMATIC.

THE PUROLATOR "MICRONIC" OIL FILTER. TYPE MF.5102. (Eng. No. V89283E —V89294E and V89333E and future)

The Purolator 'Micronic' Oil Filter consists of a plastic impregnated paper "element" which removes the finest particles of abrasive which inevitably find their way into every engine. A filter of this type will stop not only the smallest micron sized particles of abrasive, but ensures a continuous supply of clean oil to the engine at all times. The only attention which the filter needs is to see that the element is changed at periods not exceeding 8,000 miles. It is essential that this operation be carried out at the specified periods to ensure maximum filtration; to renew the element proceed as follows :—

1. Clean the outside of the filter casing.
2. Unscrew the centre bolt and remove the filter casing and the element.
   Note: The paper element, its perforated outer cover and element tube form a complete element assembly.
   Ensure that the top seal is retained in position in the groove in the filter head.
3. Withdraw the old element and clean the inside of the filter casing.
4. Insert a new element into the filter casing.
5. Fit the filter casing and new element to the head, ensuring that the spigot formed on the head enters the centre tube of the element squarely; tighten the centre bolt only sufficiently to ensure an oil tight joint.
6. Run the engine for a few minutes and inspect the filter for leaks. If leakage is noted between the filter casing and the head, the centre bolt must be unscrewed, and the casing and element withdrawn, a new top seal should then be fitted. If leakage occurs at the bottom of the filter, withdraw the casing and element, remove the circlip from the centre bolt and withdraw the bolt from the casing, collect the element support, bolt seal, washer and spring. Ease the remaining seal out of the bottom of the casing and fit a new seal in its place. Insert the centre bolt and fit the spring, the washer, a new bolt seal and the element support onto the part; fit circlip into its groove in the bolt. Place the element inside the casing and offer up the assembly to the filter head, screw the centre bolt home.

A certain quantity of oil will be lost due to the removal of the filter casing and the sump should be topped up after assembly of the filter.

The filter casing should not be disturbed until element renewal is required, to do so invites the hazard that the accumulated dirt on the outside of the filter may be allowed to contaminate the inside and thus be carried into the bearings when the engine is re-started.

If at any time the entire filter unit is removed from the crankcase, take great care to fit the joint washer correctly, otherwise damage will be caused when next the engine is started, through the "blanking-off" of the oil passages. It is advisable to fit the washer to the crankcase and ensure that the holes in the washer match those in the crankcase before fitting the filter unit.

IMPORTANT.

Do not attempt to re-set the pressure relief valve which is incorporated in the filter head, this is the main engine pressure relief valve and is set by the vehicle manufacturers to a predetermined figure.

OIL CIRCULATION KNOCK.

As a result of a certain number of complaints of this description, with early Models, it was decided to modify the take off for the oil pressure gauge. This modification was advised in our Service Bulletins No. V.52G, copies of which may be had from our Service Department, upon application.

DIFFICULT STARTING OF ENGINE.

1. Insufficient fuel due to :—
   (a) Empty petrol tank.
   (b) Restricted pipe line from tank.
   (c) Dirty petrol pump filter.
   (d) Petrol pump not working properly.
   (e) Choked carburettor jets.
   (f) Incorrect carburettor level.
   (g) Incorrect jet setting. Refer to Page 1 "General Data" Section.
2. Air leaks to the induction system due to :—
   (a) Loose nuts on carburettor and induction manifold or distorted flanges.
   (b) Defective manifold or carburettor gaskets.
   (c) Leakage around crankcase ventilation adaptor in induction manifold.
   (d) Cracked induction manifold.
   (e) Worn throttle valve spindle and/or bearing point in carburettor body.
   (f) Worn valve guides.