3.1 Lubrication - General

THE ELEMENTS OF LUBRICATION

by Roger Cooper.

In studying the particular aspect of lubrication which applies to a Scott Engine, we must examine the oil and how it is designed to achieve what we expect of it. There should be no question about the fact that only the best quality is good enough, but many people are tempted to try something a little cheaper on account of the undeniably poor oil consumption of a Scott. Uneconomical though the total loss system might appear to be, its one redeeming feature is the constant supply or cool, clean oil to all working parts.

How many riders know what a vast amount of research is being continually made to perfect the engine oil for motor vehicles? How many realise how rare straight oil is? A straight mineral oil cannot combat the corrosive effects of the acid formed by combustion, but a blended oil can. The main chemical ingrediants or additives in a modern engine oil are detergents and anti-oxidants with, in certain cases, a trace of rust inhibitor and, in multi-grade oils, a viscosity index improver.

What is a Viscosity index? It is a very important characteristic of the oil we intend to use. All oils thin out when heated, but some thin out more than others for a given change in temperature. It is therefore no test of an oil that it looks thick enough when poured into the tank. The flatter the viscosity curve, as plotted on a graph, the better the oil will stand up to the arduous high temperature conditions—hence the addition of improvers in multi-grade oils, to produce a less marked change in viscosity with change in temperature.

When selecting a base oil for automotive use, the Viscosity Index is a major consideration, but, also, the additives, detergent, anti-oxidant, etc. must be added in proportions which take advantage of the oil's natural qualities. The very chemical nature of the oil itself governs the use, and type of additives, and careful blending is required to provide a lubricant which is chemically stable under all anticipated operating conditions. The thought of a detergent, a non-lubricating chemical, circulating with the rest of the oil in an engine tends to discourage people from using a detergent oil. Some have visions of a soap powder, or metal polish, scouring away at the metal to keep it clean. Others imagine that all the dirt and sludge will be flushed out and circulated, doing untold damage. There is no connection between the detergent in a motor oil and that in a wash tub.

What does a detergent do? A detergent-dispersant, to give it the full name, is a chemical solvent which prevents the formation of gums, lacquers and sludges in the engine. It controls the carbon build-up on the pistons, cylinder heads, and particularly, exhaust ports, and helps to neutralise the acids of combustion which are so damaging to the cylinders. There is no evidence to suggest that detergents remove existing deposits, rather they allow them to wear away mechanically whilst preventing further formations. The particular application of this is on the sides of the pistons and cylinders, and in the ring grooves. It is here, also, and in the oil mist in the crankcase, that the greatest oxidation of oil occurs.

Oil doubles its rate of oxidation for every eighteen degrees Fahrenheit rise in temperature, and the insoluble products thus formed, deposit themselves in the most inconvenient places, under the piston crown, thus restricting vital cooling, leading to distortion and seizure, the increase in temperature thus created giving rise to even more oxidation; in oil ways, blocking the supply and leading to more seizures, and in the sump where, with dirt drawn in from the atmosphere and water from all the many sources, it combines to form an excellent grinding paste.

At this stage I would like to point out to the petroil fans the seriouseffects of fuel contamination. It is said that the oil condenses out of the petroil mixture, or that the petrol vapourises out of the oil when the mixture passes into the crankcase. True, it does, to a limited degree, but there are always fractions in a motor spirit which are insufficiently volatile to do so, and they remain in the oil, impairing it's efficiency by dilution if by nothing else. Even in ordinary lubrication systems there is always the risk of fuel contamination, through faulty rings and cylinders, but even more so on a two-stroke, by virtue of it's crankcase induction.

The lubrication of the cylinders is of vital importance, not only to these cylinders, but to the rest of the engine too. In addition, the cylinder of any engine, either steam, or internal combustion, is extremely difficult to lubricate efficiently. The demands placed upon the oil are numerous, exacting, and to some extent, contradictory. Oil is required to perform its duties at inordinately high temperatures, to withstand extreme pressures of both rings and pistons against the cylinder, whilst still maintaining an unbroken film for these to slide over. It must seal the rings to prevent gas leakage during compression and power strokes. It must not atomise readily into the combustion space, should have no tendency to ignite, and at the same time keep the ring lands and grooves deposit free. Ironically, these requirements must all be fullfilled at once in conditions which combine to reduce the oil's capacity for dealing with them adequately. Hence the need for the careful research and careful blending mentioned earlier. The importance of the proper lubrication of the cylinders must neve be underestimated. There is no need to decarbonise religiously every 5,000 miles, nor should there be any need to rebore before 75,000 to 100,000 miles have been completed, if due attention is paid to lubrication.

Attention must also be paid to correct carburettion. Scotts have never been economical and it is foolish to make them so. Too rich a mixture will thin the oil in the crankcase and also flush the vital oil film from the top of the bores, but too weak a mixture will cause spit-back, giving rise to combustion in the crankcase and will create serious overheating, leading to distortion of pistons and bores, especially in the exhaust port region, often the cause of an inexplicable seizure. Because cylinder lubrication is so vital, engine oil is designed to cater primarily for that need, but the bearings are not forgotten, even though they take second place. The oil is a compromise, and the bearings will have an easier life if the cylinders are well maintained.

With the exception of the little ends, the Scott engine bearings are of the anti-friction type. They are so called because the rolling friction of roller bearings is considerably less than the sliding friction of a comparable plain bearing. When we think of a roller bearing we imagine two perfectly inelastic surfaces, making only line contact with each other; but in practice, the inelastic surface, however desireable, cannot be produced, therefore the contact line becomes a contact rectangle as both roller and race distort slightly under load. Thus, when a steel roller is rolling over a steel plate, under load, it distorts itself, and the plate, to form a bow wave on the plate and a similar bulge on the trailing edge of the roller. The greater load, the greater the deformation and the resultant rolling resistance. Temperature fluctuations also affect the deformation; the higher the temperature, the more elastic the steel becomes, and the more deformed the plate and roller are. This is not a complete analysis of rolling frictions, but is given to enable the reader to have an appreciation of the conditions obtaining at a given moment while the engine is running. By their very nature these bearings cannot give unlimited service. The constant expansion and contraction of the bow wave causes surface fatigue. Thus, provided a high quality oil is in use, the pitting, scoring, and scuffing found in Scott big ends is not due to lubrication failure, but to the way the machine is driven. If the load is trebled, life is reduced to one twenty-seventh. The oil in these bearings serves to cool them, lubricate the ends of the rollers as they rub against the cage, to flush out any dirt and metal particles, and to protect the bearing surfaces from corrosion.

The foregoing paragraphs give an outline of what we expect of an oil in service in the engine. Primarily, it must lubricate effectively all the working surfaces, but, in addition, it must help to keep the motor clean by preventing the formation of deposits. It must act as a heat transfer medium, keeping the engine at as even a temperature as possible. It must be chemically stable at high temperatures, and at the same time fully capable of protecting the working parts from the corrosive action of the acids of combustion.

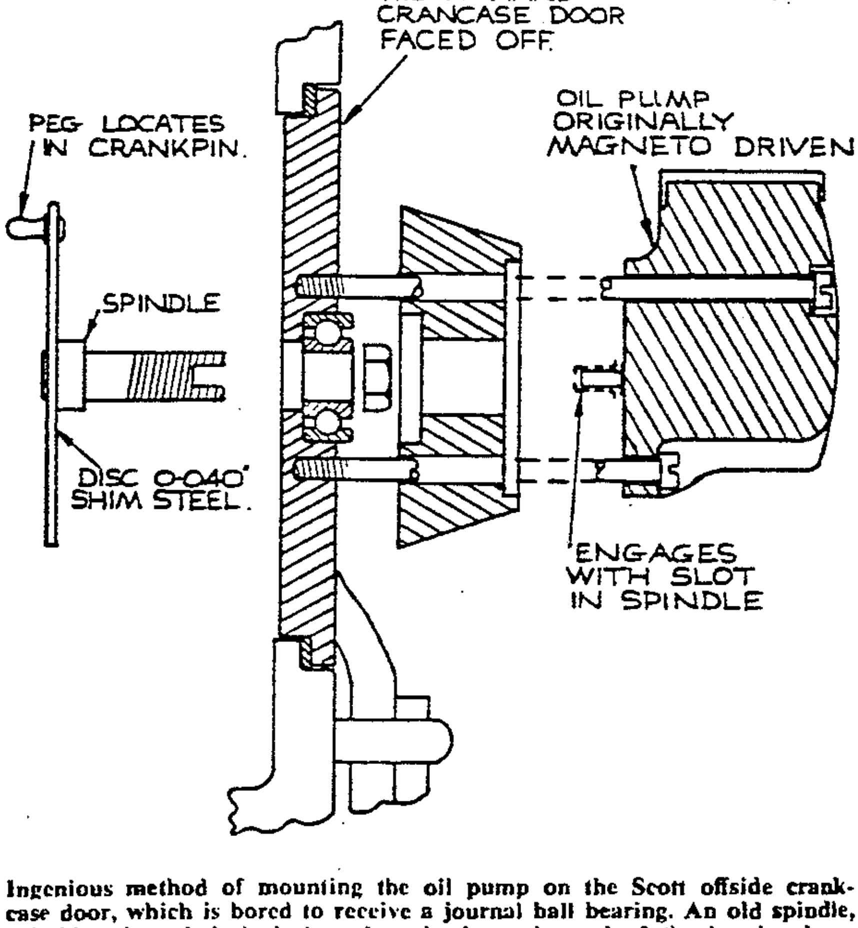
These requirements apply to a Scott equally as well as to any other engine, but it is a mistake to think that it is more efficient to have plenty of oil pouring into the motor. There is nothing better than 'just right' and an excess of oil will not only go to waste, but will actually begin to form deposits in the combustion chamber, by burning.

THE ELEMENTS OF LUBRICATION. (cont'd.)

There is no use supposing that if the oil is not good enough to do its job properly then quantity will make amends for lack of quality; it won't. Unfortunately with the standard Pilgrim pump, it is virtually impossible to control the flow for all operating speeds and leave the setting at that. If town running occurs frequently, then full use should be made of the gears because, with a high quality oil, high revs will do no harm at all, in fact, the higher temperatures and higher gas flow speeds will serve to keep the motor cleaner and drier inside. This is a point of particular interest to those who suffer from plug whiskering. The basic cause of this is oil collecting on the plugs while they are operating below their designed temperature, and then carbonising on them when the speed is increased. Any specks of dirt or loose particules of metal will hasten the whiskering process. Consistent hard driving whiskers fewer plugs than does mixed driving. As a matter of interest, it should be borne in mind that oil in the combustion chamber serves no useful purpose whatsoever.

I sincerely hope that those of you who have followed this right through will have a better understanding of the complexity of oil, and will be able to see your way to better lubrication, higher performances, longer life, and happier Scotting.

V10/4 March 1977



Ingenious method of mounting the oil pump on the Scott offside crankcase door, which is bored to receive a journal ball bearing. An old spindle, suitably adapted, is locked against the inner journal of the bearing by a left-hand-threaded nut and is peg-driven from the offside crankpin.

(Our thanks to member Nick Trahearn, of Southminster, Essex, for reproducing these illustrations from the originals.)

TECHNICAL FORUM

A series of articles on pure engineering and how they relate to the Scott.

Stan Thomas

ENGINE LUBRICATION Part 1. AND TWO STROKE OILS

(With acknowledgments to Messrs. Duckhams Oils)

Two stroke oil seems to be one of those products which is accepted by all who use it without realising the many functions it has to perform and the many difficulties it has to face. The easiest was of appreciating the difficulties which have to be overcome by the oil technologists when formulating a suitable lubricant for the two stroke engine is to follow the path the oil takes from leaving the can, to completing its work in the engine

So, starting with the oil in the can, the first qualities sought, are that the additives put into base oils used shall not 'settle out' during the period for which the can and its contents are in storage. Taking the can from the garage we measure out the appropriate quantity required for addition to the petrol (or allow the Pilgrim to do it). This is the second requirement — it must mix readily with all brands of fuel. While, for reasons which we shall see later, we would ideally require a thick oil, of say SAE 50, for the purposes of mixing readily and permanently with the petrol, the oil must be as thin as possible, consistent with other requirements which we shall go into later. In order to obtain a ready mixture of the oil with petrol, some two-stroke oils have some 10% of diluent or distillate (similar to turpentine substitute) added to the oil to lower its viscosity. It should be noted that oil dissolves in the petrol, from which condition setting out is impossible.

So with the oil thoroughly and permanently dissolved in the petrol we can look at what happens when the engine runs. The mixture is drawn in via the carburettor, into the crankcase, where it must provide lubrication for the main and big end bearings. This lubrication is effected by something between 20 and 50% of the oil in petrol "falling out" to form an oil film over the vital components. Obviously from the point of view of carrying the heavy loads imposed on the bottom half of the engine, the more viscious, or thicker the oils the better. However, the drawback to the heavier oils will be seen when considering the next role it plays. The petroil mixture passes via the transfer port, to the combustion chamber and in doing so must adequately protect the piston and rings from "picking up" with the cylinder bore or "scuffing".

Protection from this hazard is effected by a film of oil completely separating all moving surfaces from each other and again, the heavier oils show up to advantage. In fulfilling its duty around the ring zone and top of the bore, quantities of the oil become burnt during combustion, and at this stage we see immediate disadvantages to the use of heavy oils. The quantity of carbon left when an oil is burnt, varies with the viscosity of the oil. The lighter, low viscosity oils tend to burn away and deposit far less carbon than the heavier, high viscosity oils. Exhaust smoke, of course, is another point to be considered ,and the lighter oils have the advantage over the heavier oils in this respect.

Therefore, for the purposes of minimising the amount of carbon deposits left in an engine, a lighter oil should be used. This can safely be done provided chemicals are included in the oil's formulation to increase the film strength of the oil, and to protect the engine components from wear, which would take place if the engine loads were sufficient to "squeeze out" the separating oil film. Additives of these types are known as film strength improvers, and "extreme pressure agents" or "anti-scuffing agents", and in addition, the additives are "ashless" i.e. in combustion they leave no deposit.

In mentioning combustion, we must consider another vital inclusion in the formulation of two-stroke oil, that is the additive which reduces the tendency of the spark plug to whisker (sometimes also referred to as bridging, feathering or fouling).

This phenomenon is a misfortune which seems to be inherent in the two-stroke type of engine, and is the result of an electrostatic attraction between siliceous and metallic compounds in the combustion chamber, and the spark plug electrodes, (which run hotter than those in four-strokes owing to the greater frequency of firing). Wear particles from the metal components of the engine, and silica from dust in the atmosphere constitute the main ingredients necessary for whiskering troubles. Oils intended for four-stroke engines usually contain a number of metallic additives necessary in this type of unit, and these can, under some circumstances, aggravate a tendency to plug whiskering. For this reason, it is better to use an oil specifically blended for two-stroke engines.

A special additive in two-stroke oils chemically treats the particles to prevent the electrostatic attraction, and virtually eliminates the problem.

We have mentioned protecting the piston rings from corrosion and wear, but these very vital components have a further problem which the two-stroke oil has to overcome—ring sticking. This occurs mainly in two ways—one, by the oil oxidising, with the resultant formation of lacquer and varnish over the piston and rings, and two by the formation of excessive carbon and other combustion deposits which become impacted in the ring grooves and eventually prevent movement of the rings. Carbon and combustion deposits can then pass the rings and damage the piston skirt and cylinder bore.

The first problem, that of excessive varnish and lacquer formation is looked after by the anti-oxidant additive.

When oil becomes exposed to atmosphere, oxygen in the air reacts with it (particularly in the presence of heat) to form harmful corrosive products, and the oil tends to thicken. This becomes lacquer varnish which adheres to the various internal surfaces of the engine, particularly the piston, rings and undercrown. The addition of certain additives to the oil chemically interrupts the process of oxidation and significantly reduces the tendency to form lacquer and varnish.

(to be continued)

V9/2 Nov. 1974

TECHNICAL FORUM

Engine lubrication and oils. (Part 2)

Stan Thomas

The problem of ring sticking due to excessive carbon formation and combustion deposits, is again overcome by the inclusion of additives — called detergents. These operate in two ways, one by chemically treating the metal surfaces inside the engine, so that the deposits will not adhere to them, and the other way — by chemically treating the small particles formed in combustion, so that they will not adhere to each other to form larger particles. The large number of small particles are easily expelled via the exhaust system, to atmosphere, whereas the larger particles which would otherwise form would remain in the engine. These would ultimately stick rings, foul spark plugs and coat the combustion chamber and promote preignition, (or pinking) or would build up in the exhaust ports and eventually reduce the port area sufficient to cause drastic power loss, excessive fuel consumption, and overheating.

Earlier, we mentioned the oil's duty in lubricating the main and big end bearings, piston rings and bore, but it is not sufficient to protect these components from wear alone. Another serious form of attack has to be fought off — corrosion.

This can be a serious problem in a two-stroke engine, particularly one which does a lot of stop-start running or is used, say, week-ends, and then stands all the week.

So finally when you switch off your engine and leave it idle, the oil still has to do a job. The film of oil which is left all over the inside of the engine must protect the vital surfaces from corrosion, resulting either from condensation formed as the engine cools, or from atmospheric pollution. This protection has to be effected only by the very thin film of oil remaining so the oil technologists must ensure that the very best and most effective anti-corrosion additives are used.

In conclusion, we can see the necessity to employ a correctly formulated "2 stroke oil".

However, we can now apply our oil technology to the Scott. Whilst normal petroil lubrication is adequate for engines designed for this form of lubrication, the Scott needs an oil supply to the mains and packing glands which could not be provided by petroil lubrication.

Now we come to the villain of the piece — the Pilgrim Pump. To start with it is not a pump as such, but a metering device, and its main failings are twofold.

(1) Delivery is not proportionate to rev/min.

(2) Delivery reduces with temperature as working tolerances increase.

In 1 and 2 this can be offset by increasing delivery at low rev/min. (hence the clouds of smoke at low speed).

To overcome smoking and plug fouling etc., (and it can be done) we must attempt to arrive at 3 desirable requirements.

(1) To use a two stroke oil.

(2) To remote the pump from the engine, i.e. keep its temperature 'constant'.

(3) Reduce its operating speed, (this has already been done with a small epicyclic reduction).

However, for those who cannot or will not consider the above, a compromise is to use a petroil mixture, supplimented by a reduced supply via the 'pilgrim' to satisfy the glands and main bearings. In the next article we will discuss engine mods (internal and external) to improve oil consumption, lubrication and give better combustion.

TECHNICAL FORUM

Lubrication Part 3

In our previous discussion we looked at the basic requirement for a two stroke oil and concluded by beginning to apply these principles to the Scott Engine. Let us now look further at our lubrication problems.

An oil performs two basic functions: it maintains a layer between interposing moving surfaces, and it also acts as an heat dispersing medium to keep those surfaces cool.

From this we will understand why a high volume flow is essential in a four stroke engine. In the two stroke however, this task is undertaken by the petrol (or petroil) flow through the motor.

We must consider the *amount* of oil necessary to provide adequate lubrication very carefully in a two stroke, for unlike a four stroke which has an abundant supply to its bearings, over oiling will cause excessive smoke, plug and port fouling, and not so readilly appreciated, will lower the octane rate of the fuel, resulting in damage to the very components we are so generously flooding with oil!

The amount of oil required is in point of fact quite small, being a layer so thin that it would hardly be detected by the naked eye. This layer is known as the oil laminar, and provided the bearing is kept cool and the oil laminar does not break down due to over heating or dispersal, is all that is required.

However, whilst we now see that the oil requirement is much less than we originally thought, the problem is that in a two stroke, we cannot guarantee that all bearings will receive adequate lubrication if we only supply the *total minimum* oil required. Clearly what we must do is to over-oil, assuming that a small percentage will reach all vital surfaces. Perhaps a good example is the small-end bearing, which under normal conditions, operates in a static gas region, and therefore, very little oil circulates around its bearing surfaces.

Let us now follow the oil from the moment it is metered into the engine, and discuss in detail each component.

First we have the packing glands. These in retrospect were ideal for the original design, being as they were all that was available and known at the time, before the invention of synthetic rubber lip seals.

However, if they are a perfect "mated" fit, once the oil is interposed between the two surfaces, they will be held apart and this will actually induce the oil to flow outward, and of course leak.

In point of fact, a "worn" packing gland assembly with coaxial wear grooves therein will give better oil retention than new!

Incidentally a hard felt packing between the sprocket and crankcase will collect any residue oil from the glands and distribute same to the primary chain(s), so assisting in their lubrication.

The main bearings, running as they do at a uniform speed, and being relatively cool, do not suffer unduly, as they do have the benefit of the fresh oil entering the engine. Several points are worthy of mention however. Being a crowded roller design, scuffing of adjacent rollers does occur. Also, they are subject to the adverse effects of mis-alignment as the crankcase heats up and distorts. To this end, a ball race would give better service, for not only would it allow slight mis-alignment, but would also give precise end-float retention, thus allowing lip seals to be employed.

The big end bearings are the most highly stressed bearings in any engine, and an article of this nature can only begin to explain the problems of design, lubrication and stresses encountered in a high speed reciprocating engine.

By far the biggest problem in a roller big end (as opposed to a shell or white metal type) is the alteration of roller speed as the crank rotates.

Assuming the crankshaft rev/min to be constant. one would expect the big end rollers to be revolving at a constant speed also. Unfortunately, this is not so. for because of the angular movement of the connecting rod. the big end rollers accelerate above the mean rotational speed as the crankpin leaves the T.D.C. position. and de-accelerate below the mean rotational speed between B.D.C. and T.D.C.

It is this effect (even more so than the normal scuffing associated with a crowded roller design) that damages the Scott big end. The problem is that the rollers. being so large. have such a mass that their inertia will not allow them to accelerate and de-accelerate so violently. and "skidding" with the tracks occurs.

A number of engineers have very successfully caged the big ends. in an effort to eliminate inter-roller scuffing — and very successful this has proved to be. What they also do of course is to reduce the mass of rollers by reducing their dimensions. so that they will more faithfully respond to the dynamic loads imposed upon them.

Before leaving the subject of big ends. there is one problem which is almost unique to the Scott Engine. namely the "barrelling" of the big end rollers. This is caused by three factors:— Firstly. the rollers. because of their relatively large diameter. attempt to turn sideways in their tracks (this effect is greatly reduced if we employ a roller with a greater length/width ratio). The second cause of barrelling is the deflection of the crank cheeks under load. This of course could only be eleminated by a re-design of the crank assembly. The third problem is flexing of the connecting rods. Suggestions have been made to positively locate the rods on the gudgeon pins. but whilst this is an excellent idea in itself, unless the crank deformation problem were overcome also. severe bending loads would be imposed on the rods. which could ultimately result in breakage.

Assuming that without the resources necessary to re-design the major components. what can be done to improve the big end assembly? Obviously. caged rollers are a priority. but I feel there is school for thought along the lines of a larger diameter crank pin. thus giving the opportunity to use more smaller diameter rollers. (possibly of metric size).

Because of their smaller diameter. although they would rotate faster for a given crankshaft rev/min, their peripherial speed would be no greater. Obviously. to accomplish assembly. the crank would have to be assembled minus the enlarged crank pin track. This track could then be a slight taper fit on the crank. held by the clamping action of the big end lock screw. and Loctite compound.

Finally. let us look at the lubrication of the big end assembly. This. under normal conditions is adequate. for here we must appreciate that big end life is determined by its design. and no amount of over-oiling will improve matters.

We can now turn our attention to the small end bearings. These are quite adequate. but do suffer from under lubrication. We saw earlier that the small end operated in a "static gas region", which simply means that the mixture which is present "inside" the piston. is not part of the "flow" through the engine.

The answer to this problem is quite simple. and that is to fit a stuffing block (or a pair) to the crankcase. This (or these) will displace the gas under the piston crown. as the piston descends. and create a strong turbulence as the piston ascends.

This turbulence will also promote cooling of the piston crown — which we shall see is so necessary in the next few paragraphs.

Because of the constant possibilities of piston seizure. the average owner will over oil to the extent of creating the smoke-screen now so synonymous (and yet so unnecessary) with Scott Motor-cycles.

(To be continued)

TECHNICAL FORUM (Part 4).

Stan Thomas.

We said at the very beginning of our article, that the quantity of oil required increased above the corresponding proportional increase in engine speed, whilst the Pilgrim pump's delivery actually decreased in proportion to an increase in its operating speed. Hence the reason that having adjusted to provide adequate delivery for fast riding. Far too much oil is provided when riding speed is reduced.

However, the cause of seizure (other than above, cannot be overcome by merely increasing the volume of oil, and is again a design problem.

Because of the unequal mass of a deflector piston, when this type of piston is heated, it will distort, with the results all to often experienced. Normally, a piston is oval turned, giving a smaller diameter across the gudgeon pin axis, to compensate for this effect, so that when the engine is a normal working temperature, the piston is "distorted" to a true circular shape.

However it is difficult to machine a piston to allow for this if it is of a deflector design.

I once heard of an owner putting his block on the gas cooker with the flame up the exhaust to simulate "running" and then lapping the piston to suit! He claimed that after many hours of careful work he never seized up again, although the pistons were noisy when cold. Obviously, he had eliminated, to a great extent, the high spots caused by distortion.

Another cause of seizing is the carbon seizure. This is caused by the carbon formation on the sides of the piston, between the deflector and the cylinder walls, and usually manifests itself when the engine is extra hot, ie after a high speed run following a long period of lower speed operation. When the piston seizes. usually the piston material is blurred over the rings, and because the rings are then firmly in the base of their grooves, a considerable loss of compression will result.

Perhaps it would be pertinent to discuss the actual fitting of piston rings. Do not ever fit rings intended for a larger bore engine, by filing their ends down to "re-gap" them. Piston rings are designed to give an equal radial pressure on the cylinder, and using a larger ring filed down will upset this characteristic. On the other hand, perhaps we could dispel the myth regarding ring gap.

Providing the gap is no less than the *minimum*, an extra large gap will not have any adverse effect on compression or performance. Because checking ring gaps was the easiest, cheapest and more often than not the only "technical" operation an owner could perform in days gone by, the legend grew up that if the ring gaps were a few thousandths too much they were scrap. In point of fact, it is not unusual for some tuners to remove the top compression ring for racing purposes.

With regard to piston and ring lubrication, the amount of oiling required is quite small, provided adequate dispersal of lubricant in the petrol takes place. The situation in the Scott Engine is quite ideal, i.e. neat oil on the mains and partially on the big ends, and petroil on the pistons and rings. However the transitional period for oil disolvement is quite small, and in any case, the resultant petroil is carried immediately by the gas flow into the transfer ports etc. This causes an unequal distribution of oil between the cylinder walls and the piston. and unfortunately it is the exhaust side which receives the lesser amount.

The use of stuffing blocks, as described earlier. does however promote greater turbulence and greatly assist lubricant distribution.

There is little modification that can be performed to assist lubrication; except for putting a very slight radius on the edge of the piston rings, and relieving very slightly the exhaust port bridge.

This concludes our brief look at Scott Engine lubrication, although of course it is hoped the article will promote further interesting reading in "Yowl".

PICKING THE RIGHT HOLE (Part One)

Quite a few Flying Squirrels that I have looked at over the past few years have had the petrol or oil taps in the wrong place, including one I purchased recently which had them BOTH in the wrong place. This is particularly important for the oil tap, because the 1/8" B.S.P. hole in the tank is ONLY for either a drain plug or a chain oiler dripper. Your oil tap should go in the bigger 1/4" B.S.P. hole, and the supply pipe to the Pilgrim Pump should be of 5/16" or even 3/8" O.D. Otherwise particularly in cold weather, there is a serious risk of oil starvation, and the poor old Pilgrim Pump gets the blame again!!

Also make sure that the oil tap used has a good sized bore, to match the tubing, or it will also restrict the flow. Beware the use of adapters commonly sold to allow 1/8" B.S.P. taps to fit 1/4" tank holes. The 1/8" B.S.P. tap is just not big enough for engine oil supply. For those who are a little confused by B.S.P. ("gas") threads, I can now make you even more confused ......

1/8" B.S.P. equals approx. 3/8" outside diameter of thread.
1/4" B.S.P. equals approx. 1/2" outside diameter of thread.
3/8" B.S.P. equals approx. 5/8" outside diameter of thread.

The plot thickens, because all sorts of "bastard" fittings can be encountered, enabling tubing of different O.D.'s to be connected to the same tap. For instance, you can get 1/4" B.S.P. nuts and olives for both 1/4" AND 5/16" tubing. Similarly, you can get 1/8" B.S.P. nuts and olives for 1/8" AND 3/16" AND 1/4" tubing. I could go on ....

Clear as mud isn't it? The alarming point is, that with very thick-walled tubing, you can get a pipe of only 1/8" bore connected to a 1/4" B.S.P. olive, nut, & tap. It looks big and meaty but the Pilgrim Pump is gasping for oil!

Exactly the same situation applies to petrol taps, as the 1/8" B.S.P. ferrule in the bottom of the tank is ONLY for the drain plug, (or second float chamber on "Clubman Specials") The petrol tap should be in the 1/4" B.S.P. ferrule.

I wonder how many hours have been spent by Scott owners dismantling carburettors, looking for blockages, when the real trouble all along has been a miniscule tap, causing occasional fuel starvation.

Whilst still on the subject of taps, never blindly assume that the lever is horizontal when turned OFF, and vertical when turned ON. I have encountered quite a few taps where the lever is at 90° to the hole, and not in line with it. The manufacturers should have been locked up!

I found some beautiful nickel plated slide action Ewarts taps and fittings last year when ferreting around in a scrap yard. They were on the back of an old gas cooker, and used to supply the grill and pilot lights. When three decades or so of congealed chip fat had been removed they polished up just like new.

Anyway, enough of my rambling; the only important bit to remember is that you should have 5/16" O.D. tubing, 'twixt tap and Pilgrim Pump, the tap should be of suitable bore, and be screwed into the 1/4" B.S.P. tank ferrule. Have I got you wondering? Nip out to the shed and check. It might save your engine; or save the Pilgrim Pump from eternal damnation.

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PICKING THE RIGHT HOLE (Part Two)

Despite all that has been said about Pilgrim Pumps over the years many owners just do not seem to realise that the thing is not a pump capable of generating real pressure at it's outlet, or suction at it's inlet. It can only be considered a metering device, and it is only the partial vacuum in the crankcase, when the piston is rising, that sucks in the oil.

If you disconnect a 1/8" BSP tap and 1/4" OD pipe supplying a pump and watch just how slowly it oozes out it is frightening, and it certainly confirms to me that many oiling problems are laid unfairly at Mr Pilgrim's door. As I said in Part One, it should be a 1/4" BSP tap and a 5/16" OD pipe.

Loose and leaky oil pipe connections are another major cause of problems. I pointed out a leaking, badly soldered nipple to one owner last year and he said "It doesn't matter, I have turned up the oil supply a bit on that side to compensate for the oil leaking out." When I explained that the oil leaking out was nothing compared to the air being sucked in, instead of oil, he went quite pale! He, and many others I'm sure, just didn't realise that those connections are subject to suction and not significant pressure. Of course the glands suffer, air then gets sucked in there too, and a whole vicious circle of air leaks, no oil, bad running, bearing trouble, and subsequent disaster starts. And the Pilgrim Pump gets all the blame! Any problems with glands, crankcase doors, drain plugs, and gaskets will cause lubrication failure and disaster. The crankcase must be perfectly gas tight for proper lubrication, smooth running, and easy starting.

Similarly, weeping oil pump banjos are dangerous as air will be sucked in when the engine is running, in preference to oil. Do not tolerate even the slightest oil leak as it will bring disaster, sooner rather than later.

If leaks are occurring that seem to be down the threads in the pump body it is usually possible to effect a repair by wrapping plumber's PTFE tape around the connector before screwing it home, making sure of course that fragments of tape cannot get into the pump or pipe.

If the threads are too far gone they can be drilled out and a "Helicoil" or other threaded insert installed. Helicoil tapping drill sizes are as follows:-

1/8" BSP — Drill out 25/64"
1/4" BSP — Drill out 17/32"
3/8" BSP — Drill out 43/64"
1/2" BSP — Drill out 27/32"

(Our recently retired Spares Secretary Gerry Howard specialises in Pilgrim Pump repairs and overhauls).

No matter how good the Pilgrim pump is, and all it's attendant pipework, I have never been happy with settings less than four-spits-to-each-drop. Anything less than that and they can be erratic. The answer, as preached before, is to open up the pump to a safe setting and then compensate for the increased flow by slowing down the pump with one of Gerry Howard's reduction gears, by courtesy of Messrs Sturmey-Archer (see pages 212 to 216 Dec '89).

As I mentioned in the August issue, the oiling problems seem to have been solved by the "Old Hands" and hopefully this pair of articles has also helped. I couldn't resist the August issue cartoon though, and hopefully the Banbury Run programme writers will eventually drop the "Smokey Joe" labels!

BM

PICKING THE RIGHT HOLE (Part Three)

I had not originally intended this scribble to run over three issues, but it has raised some remarks, and I think a little more comment could be useful. Firstly, I really do think it VERY worthwhile to check the oil flow feeding a Pilgrim pump as it can be surprisingly poor if you have only a 1/8" BSP tap and 1/4" O.D. pipe; particularly if you let the oil level in the tank fall too low, thus reducing the gravity head. Even the shape of the oil tank plays its part, and if you think about it a wide flat-bottomed tank is at a great disadvantage compared to say a two-speeder tank containing the same volume of oil.

There are other more subtle factors causing the final flow rate as it is due to a combination of the initial viscosity, ambient temperature (especially with monograde oils such as our favourite Silkolene Super Two), bore of tap, bore of pipe, length of pipe, kinking of pipe, even the internal surface finish of the pipe. The whole thing is a complex interplay of viscosity, surface tension, drag, suction, capillarity, gravity and good old Scott perversity.

It might well be suggested here that I don't know what I am talking about (not for the first time!) However I do, and this could be an appropriate moment to say that I have laboratory experience of testing lubricating oils for viscosity, contaminants, flash point, ash, film strength, electrical resistance, detergency and various other factors.

Apart from the physical chemistry bit I also have a City and Guilds 389 Certificate in Motor-cycle Mechanics, and a BTEC (First) in Motor Vehicle Engineering. So I do know my Redwoods from my Centistokes, and just a little of how they apply to motor-cycles. But never mind these slippery, elusive units, just let it FLOW, and don't use multigrade oils except in an emergency to get you home.

B.M.

V17/1 Dec. 1990 **Woodford Green Essex.**

Dear Brian,

Regarding your article "Picking the right hole" in the October issue, I fully agree with you regarding a 5/16" O/D (1/4" I/D) pipe being the minimum to feed the oil pump.

The present bike I am building is a 1927 3-Speed Super, with a late Flying Squirrel gearbox, with a 1926 small diameter clutch. I have modified the frame to take a 1928 type handchange gate and lever. As the bike is built from parts, and I was offered a long tank, which I believe is 1930 2-Speed Sports Squirrel, I have fitted this tank. The filler caps are in line astern, (*Ed: Obviously a marine engineer writing this letter, everybody else would say they were in tandem!*) with the rear being the oil tank, and the oil tank extends below the petrol tank, and has a horizontally placed hand pump for the gear. I have blanked off the oil pump, after removing the internals, as it's purpose, ie. the 2-speed gear, is not fitted.

The point of this letter is to advise that the only outlet from the oiltank is tapped 1/8 Gas (BSP). I therefore do not have a choice.

Prior to reading your article I had already decided that the hole was not big enough, so I have drilled out the right-angle piece, and the tap I am using, to the very maximum but unfortunately not to the 1/4"' I.D. I would have liked.

As you can see I had Hobson's Choice and this might apply to other tanks.

Best regards — **Peter Maddox**

Ed: I have found two tanks in my collection of bits and pieces that have only 1/8"' BSP oil compartment outlets. One is a 1931 Sports Squirrel long tank, presumably similar to Peter's, and the other is a 1926'ish 2-Speed Flying Squirrel "long" tank, with front oil compartment. That one however has two 1/8 BSP outlets. One could always try drilling and tapping a 1/8 BSP tap ferrule out to 1/4 BSP, and if that fails, soldering in a new ferrule.

* * * *

REGARDING PISTON SEIZURES

by *The Technical Correspondent*

Dear Mr. Mugleston,

I'm sorry to hear of your trouble but I'm afraid it's a pretty common story that you tell. The first thing to find out is whether the seizures are in fact due to lack of oil. A slight lack of clearance at the last rebore could result in persistent seizures whenever you take her over 55 to 60 for more than a minute or so. The trouble lies in the uneven heating of the front and rear of piston and cylinder, due to the exhaust and transfer being on opposite sides. The pistons expand to oval and bind up in the bores. After perhaps even one such seizure, the pistons can become permanently set oval at the skirt and bind in the bores even when cold. You do not say if one piston only seizes, or both and this restricts the scope of my diagnosis to some extent. I usually employ a proecss of lapping the pistons in whilst heated by a gas flame directed into the exhaust port. The pistons and bores are "eased" wherever greying of their surfaces shows contact is occurring, until the components remain free of binding even when smoking hot, (oil and "Bluebell" for lapping). The pistons are then no longer round when cold but are a perfect fit when at working temperature. After this treatment, I have a Scott which at last can be "hammered" and goes all the better for it. The trouble is that when starting from cold it has piston slap and appears a bit sluggish, just like some 4/strokes. The compressions however also resemble a 4/stroke, (when engine is hot you can stand on the kick-start).

If you strip your engine, check the pistons for circularity by entering them into the cylinders, inspecting the gap between skirt and bores. Ovality can be cured by a "re-distorting" process but it is too long a subject to go into just now. Filing them down is useless since the skirt clearance will then be excessive.

Piston overheating can also arise from retarded or overadvanced ignition, or burning of carbon deposits.

The oiling side of things has many aspects. Firstly, is oil being delivered to the pump ? Secondly, is it getting to the engine ? And thirdly, is it getting into the crankcase ? I have previously discovered 1/8 ins. bore pipe being used for the pump feed (should be ¼ ins. bore minimum) and oil tanks fouled with old congealed oil. Distorted and fractured corks in oil taps have also been the cause of oil starvation at the pump.

Lack of delivery to the engine, assuming that oil gets to the pump, can be due to a faulty pump (these get very tricky to set when worn) or due to an air-lock occurring. All air must be bled out of the feed pipe from the tank ; (allow oil to leak out of the union for a minute or so before the pump connections are all tightened). Open up pump adjusters and run engine until the oil is delivered at sight feeds, without bubbles. Oil pressure in the engine feed pipes is below atmospheric when running at low speed since the "rotary valve" action of the "timed" drillings in the packing glands of the main bearings cause crankcase pressure fluctuations to actually suck in the oil. At high speeds however, this does not hold good and it is then that any leaky unions, or a weak oil pump, causes loss of oil feed ; just when the poor old engine needs it most. The moral is—see that the pipes and joints are sound.

Having got the oil to the engine, the next question posed is as to whether it is getting in. If an engine has been run dreadfully short of oil, the packing glands in the main bearings are almost certain to be scored. They will not, therefore, provide a proper gas seal and will leak oil profusely into the chain compartment. The engine, of course, is not getting its share. A lot of oil dripping out of the engine compartment will tell its own story here.

The packing glands can be tested by removing the tank and engine casing top covers so that the sprockets may be observed. Arrange a lead lamp to get a good view. Put a piston at T.D.C., remove transfer cover and pour about ¾ of a 1 lb. jamjar of paraffin into crankcase so as to submerge crank disc completely. Rock flywheel and look for tell-tale streaks of paraffin. A leak that allows only a dribble will affect carburation at low throttle settings but a steady drip will spoil the engine completely and cause loss of oil when running. Check out both sides.

Whilst on the subject of packing glands, these are very much left and right handed affairs. They *must* be correctly fitted. If swapped over L to R, or if two the same are in an engine, trouble will definitely ensue. As previously explained, the holes are timed to register on crankcase suction, but if swapped over they will register on crankcase pressure. Usually no ill effects are observed until large amounts of throttle are used, whereupon the pump becomes airlocked by the back pressure (usually only on one side) and a seizure soon follows. This might well be your trouble. I am repeatedly finding it on machines which infuriated owners have eventually abandoned in disgust.

A fool-proof method of checking was described in the October *Howl.*

If the glands are reversed, a strip-down is the only answer. They can then be lapped-in with fine grinding paste, the end float adjusted, pistons checked etc., and a new start made.

I must emphasize also that a good conventional Pilgrim pump can supply oil perfectly OK for "Belting." It is its excessive delivery when in town and its fluctuations which make the present arrangement unsatisfactory. My old '28 Flyer never gave any trouble (except for the odd smokescreen) once her glands were put to rights and a new oil pump fitted. The pump was on the magneto platform of course ; a '29 model I had later used to require the pump adjusting daily, according to the thermometer and barometer readings. That pump was on the crankcase door and it gets too hot down there on the engine.

I hope the foregoing helps a bit. When you come to do a stripdown, I have some handy "cartoon strip" service sheets now to hand that may help you. Send 2/6*d.* Postal Order to cover the photo-printing and postage if you should require one.

*These are now available from our new Membership Secretary:—Harry Beal, 25, Beeleigh Cross, Basildon, Essex.

POTTY PREACHES

The subject is Scott glands and lubrication.

Most of this article is culled from correspondence I had with the late Phil Smith and from original papers that he lent me of Alfred Angus Scott himself.

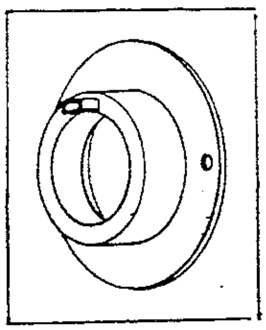
Phillip Smith, A.M.I.Mech.E. was the author of such books as "the Greatest of all Trials", "The high speed 2-stroke engine", "The scientific design of exhaust and intake systems" and a great many other books. He rode in the Scott Trial several times before the War and also entered a Scott in the Manx in 1947, which unfortunately retired through lubrication trouble.

We used to have a saying in this Club "Alfred knew best" and both Philip Smith and myself soon learnt how true this saying is.

GLANDS

These are very important, often machines have the wrong glands fitted, following rebuilds. There are two basic types (I'm not on about sizes).

1. *Suction Glands*—used with drip feed and Pilgrim Pumps. On early machines these are usually unmarked, being interchangeable. The oil holes (Veterans had slots) are about 90° clockwise looking at the tongue and are designed so as the oil holes register atmaximum crankcase suction (about 60° B.T.D.C.). Later Super glands may be marked. The larger Flyer and Rep. glands are nearly always marked R.H. & L. H. (They are not inter-changeable) and have three holes instead of one. However, they still cover the maximum suction range.



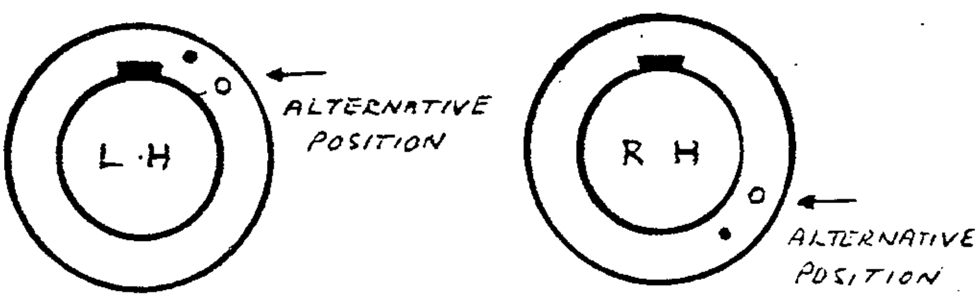
Suction Gland SuperType
For use with Pilgrim Pump
or drip feeds.

2. *Mechanical Pump Glands.* Philip Smith used to call these Atmospherical Glands (?) and are intended only for use with the Best and Lloyd

Suction Glands Flyer and Replica Types. For use with Pilgrim Pumps. (Can be used with drip feeds) pump using split feeds and restrictors in the unions. The oil holes in these glands were designed to register when the crankcase had little or no suction, i.e., when the pressure was theoretically atmospheric and occurred somewhere around T.D.C. The left hand gland had its oil hole somewhere in the range 30° - 60° clockwise from the tongue and the R.H. one 130° - 170° approximately, (these figures are taken from old glands) they obviously varied quite a bit.

As another theoretical atmospheric pressure occurred in the crankcase at about B.D.C., it is possible that some machines had glands which had holes 180° opposite those shewn (Does anybody know?). (Also, what are the glands like for Flyers fitted with these pumps?).

TESTS. To find out what sort of glands you have fitted, fit on rubber tubes to the unions in the crankcase and blow! A good test for suction glands is to put a blob of oil on the end of the pipe and with the crankcase doors on of course, turn the engine slowly over by hand—it will disappear in double quick time. (Plugs can be left out).



Atmos. Glands for use with Best & Lloyd Pumps.

OIL SYSTEMS.

1. DRIP FEEDS. Alfred's original system and positively the best system for any Scott (so long as you have the right glands fitted). In their last and best form they had two adjustable drip feeds coming from a tank just to the rear of the steering head. Instantly accessible and easily adjusted as you were riding along.

You don't even have to look at the feeds, merely set the little pointers on the adjusters, whip them right open for fast work, close them right down for traffic jams, or open them just a couple of notches. Normally however, just set them and leave them. I have found no snags with them and use this system now, for both racing and touring on the Sprint Special.

BEST & LLOYD. Beautifully designed pump, but having only one outlet, the feed had to be split, and in an effort to stop one side getting all the oil, restrictors and atmospheric (?) glands were fitted. Unfortunately, the two crankcases never have equal pressures and as one shoot from the pump has to do several revolutions, the biggest sucker always wins!

The slightest fraction of a pound difference will either starve or over-oil the respective side. If suction glands have been accidentally fitted, the first one to suck will get a whole pipe full and the other nothing. With the proper glands and restrictors and with a new engine it can work quite well for a while, but to quote Philip Smith "of course the system either oiled or seized according to engine speed and pump setting; crankcase pressures vary according to efficiency as dictated by condition of the bores, rings, packings and so on, and scavenge conditions at the time, you sometimes get positive pressures due to backdraft on transfer, induction etc., sometimes negative pressure of the exhaust pull gives good cylinder vacuum and so on. So when the motor gets a shade ropey . . ."

Of course the adaptation of this system by Mavro works very well (see later under mods.) However, I have recently seen several examples of machines using a single oil pump and split feeds with no restrictors *and with Suction Glands*, most of them were suffering with oiling problems.

If you must fit a single outlet pump, go Mavro!

You have only to think about crankcase pressures or lack of it for a few minutes to come to this conclusion.

PILGRIM PUMPS (twin feed of course) should be used with suction glands, under which condition it must be realised that the pump only meters oil and does not pump it. The Pilgrim pump is a very nice pump especially if its later peg type form. Unfortunately it was never designed for the Scott.

They were designed to run at half engine speed at the end of a four stroke timing shaft. Its main fault is that the relatively high speed at which it runs, the pump plungers only move about half a thou!; this is not enough to clear the slightest speck of dirt or air lock (main trouble). Also the powerful suction against the main outlets together with temperature and viscosity of the oil tend to upset even the most careful of settings.

Biggest sin you can commit (I know, I did it) is that on finding the pump somewhat unreliable, you turn it down a notch and put some oil in the petrol thinking this is a 'belt and braces' technique. Unfortunately, this only makes the pump worse. Please don't put oil in the petrol, it doesn't need it. Turn up the pump to the maximum you can get away with without becoming a pollution hazard, e.g., one in 5 or 6 for normal running or about one in 3 or 4 far fast work. This is far more oil than it will ever need but it keeps a good pump reliable. If you drive in a Metropolis—buy a Honda! If you are a fast bloke—develop an instant left hand.

ANSWER: Reduction gear to pump at least 2 to 1. I have seen several neat ones, owners all satisfied! Dennis Wray made one out of scrap Sturmey Archer 3-speed bike hubs, for his Super—cost NIL, 1 hours work. However, if you do it, remember to keep the direction of rotation the same, or get a different handed pump. Also try to get hold of a peg type if you have an end cam type, as the cams are made out of die-cast cheese.

MODIFICATIONS.

1. Drip feed: These can be put anywhere, on the handle bars if necessary, but on the saddle tank jobs, the easiest place might be just on top of the tank on a little plate made to come from the tank mounting. Remember with suction glands, you can suck the oil up to them, provided THERE ARE NO AIR LEAKS.

2. Petroil: (a) *Crossover system*. All I can say is that it works well, provided the pipes have very small bores. Trouble is that if you run an end (which some people do regularly) it feeds all the foreign bods from one crankcase to the other's main bearings, and crankcase cups are not an off the shelf job. The cups have to be ground in situ on a special grinder in the factory the one cup registering off the other. So I don't fancy this system one little bit.

(b) CLIVE WAY SYSTEM: As fitted to his road bike (not his racer). Perhaps I can give you all the details in a later article, when I can get his permission, or we can perhaps get him to write it. The system works perfectly, but some internal work has to be done.

(c) MAVRO SYSTEM (See Yowl, Vol. 3, No. 3). This system works perfectly well and does use a Best & Lloyd or Silk pump with split feeds, but at high output and with a system of bleeds, feeds, meter jets and by-passes. Perfect in use from all accounts, but personally I think it is too complicated for most owners.

(d) LOFTY LUBE (See Yowls, Vol 4, No. 8 and No. 11.). It works very well—doesn't under or over oil, and it seems very convincing. Ever seen a Scott tick over for a quarter of an hour on its stand, then yowl away flat out with hardly a trace of smoke?

This system uses a Pilgrim Pump very slightly modified to feed and scavenge the engine. Trouble is of course the lack of filtering to speak of, all that muck in the scavenging again—don't fancy the bits in my mains. Also it is a little too complicated for most owners, and can get smokey if a non-return valve sticks.

OILS. Best oil I've found is Silkolene Super 2, very good and relatively cheap. Next best, any old cheap straight oil you can get, you know the 40 pence a gallon touch at the local motor factors, S.A.E. 40 or 30. I even use Commercial in the summer when I can get it. We don't need need all this anti sludge, visco static, long life stuff that we put in our cars, it only goes straight out of the Burgess anyway. The expensive oils actually make worse ash deposits in the combustion chambers because of these additives. Castrol **R** is out, for normal road use anyway.

I've said my little piece, now please let us have your views. Say its a lot of codswallop if you like, but let us have your comments in print in this magazine. I will willingly answer any questions.

Don't wreck your Scott for lack of lube.

"Potty" Chambers.

ERRATUM — ERROR — MISTAKE — CLANGER BOING — CLANG ! ! !

In our rush to beat the G.P.O. and the delays with Christmas traffic to ensure that Yowl arrived in reasonable time in January we dispensed with page proofs . . . and by doing so, we have wrecked the point of poor Potty's Sermon.

He writes as follows: "There has been a horrible mistake in the article . . . please print the attached letter to explain . . .

I am sorry to say that because of printing errors in my last article on glands and lubrication should add to the confusion instead of clearing it up.

The glands shown on Page 11 are all SUCTION GLANDS, PLEASE GET OUT YOUR PENS AND WRITE BESIDE THE TOP DRAWING "SUCTION GLAND SUPER TYPE FOR USE WITH PILGRIM PUMP OR DRIP FEEDS."

BESIDE THE BOTTOM DRAWINGS PUT "SUCTION GLANDS FLYER AND REPLICA TYPES FOR USE WITH PILGRIM PUMPS." (Can be used with drip feeds).

On Page 12 beside drawing write "ATMOS GLANDS FOR USE WITH BEST & LLOYD."

No one has yet been able to tell me what Flyer glands are used with Best & Lloyd pumps.

Sorry for all the troubles,

Potty

SOME NOTES ON 'POTTY'S PREACHINGS'

1. **Petroil.** The cross-over pipe system does work, and I have known people who have used it with complete success. The following points have to be observed, however.

(a) To avoid passing metal particles through from the sumps to the main bearings you have to make sure the pipes are tapped into the sumps well above their lowest points.

(b) To make doubly sure magnetized drain plugs can be fitted to trap steel particles.

(c) In any case the sumps should be drained off and filled regularly.

(d) It is important to remember that when petroil is used, carburettor jet sizes should be increased since the petroil mixture is more viscous than neat petrol. (Scott TT riders always used a little oil in the petrol in addition to other oil systems).

2. **General.** A lot of so-called lubrication troubles are in fact caused by incorrect carburation almost always too small a main jet, which causes pistons to run hot and distort, leading to high spots. You risk piston seizure regardless of how much oil you feed in.

3. **Crankcase suction and drip feeds.** I agree with all that is said that this is the most reliable system and the easiest to use—it is also the most economical on oil. I think that it is worth mentioning of some of the snags, however.

(a) It is very important to make sure that there are no air leaks in the pipes or drip feeds. Because the whole system operates in a state of depression below atmospheric pressure, leaks are not so easily spotted as with other systems.

Particular attention should be given to the drip feeds themselves, the seating of the sight glasses (beware of chips off the glass) and the top gland surrounding the needle valve adjusters.

(b) Wear on the tongues driving the crankcase glands (and the flywheel key-way) can retard the timing sufficiently to spoil the suction. The solution is to remove the tongues, form square slots in the sleeve part of the glands and extend the crankshaft key (with squared ends) to engage the female slot in the glands. This scheme is much less susceptible to wear than the original. Flyer glands being larger in diameter are probably not as prone to this form of wear as Supers.

(c) Of course, care must be taken to see that pistons and rings are in good shape, or you will not get good suction, or even suction on both sides.

4. **Types of Oil.** Although a few years ago, I would have agreed with your opinion about the use of straight oils, modern multigrade oils appear to work very well and have the great advantage of flowing well through drip feeds at low temperatures, before the tank and drips are warmed up by the radiator. Contrary to popular belief, they burn with a very low ash residue and undoubtedly keep pistons and rings cleaner than the old types.

On NO ACCOUNT should castor-based oils be used, even for racing. They play havoc with piston rings at high temperatures—I know from experience.

THROTTLE-CONTROLLED PUMPS

Theoretically, the throttle-controlled pump is the best arrangement for road use. The Scott pump was far too cumbersome but I would like to see something like the one used on the 3-cylinder Kawasaki, which varies the ratio of oil from about 1:90 at idling speed to about 1:20 at full throttle. It is extremely neat, installed inside a cover on the right of the crankcase with connections to the main bearings via polythene tubes.

Ted Fargus

HAS POTTY NOW CONVERTED?

After Potty's Preachings, we now have the following information from Brian Woolet of Scott Swift fame:—

May I add a little to what Mr. Chambers has remarked on the subject of oil systems for Scotts? As you know, the Swift is fitted with a Yamaha autolube pump. Admittedly, I have only done about 500 miles, but so far the pump seems 100%, the exhaust just has a trace of oil smoke at all speeds and I have long since stopped putting oil in the petrol.

The pump is from a 125 c.c. YAS 1 model, but I believe that all these pumps are similar. They are freely available because the (literally) hundreds of Yamahas that are converted to racing almost all run on petroil. No modification is called for on the pump itself.

To obtain a similar reduction to that used by Yamaha, I mounted the pump on the gearbox. This entailed boring a hole in the end cover concentric with the bearing housing for the main shaft and having a slot ground in the end of the shaft to drive the tongue on the oil pump shaft. Then a piece of Dural plate ⅜" thick was mounted on to the gearbox end with countersunk screws (Loctited) and the pump affixed to this plate. The plate carries an oil seal (also a Yamaha part) through which the oil pump shaft passes.

The standard Yamaha junction box is used to connect the throttle and oil pump.

Naturally the oil pump does NOT turn when the gearbox is in neutral, but this doesn't seem to matter too much in practice. The pump has a priming device to use when the machine has stood with an empty oil tank, and this rotates giving a visual check that the pump is working—although of course you can't see the oil unless you use transparent plastic pipes.

If anyone is interested in copying this set up, I am sure George Silk could do the necessary modifications, and being in the heart of Yamaha country, he could possibly supply the pumps, etc. as well.

The only object of this exercise was to have a RELIABLE MODERN "OVER-THE-COUNTER" THROTTLE-CONTROLLED PUMP. No alteration to the engine or the glands was contemplated—they work fine.

I am happy to say that the Swift is going better and better; modifications have decreased (but not eliminated) the vibration, and the carburation is now even better. Last proper ride was on Boxing Day when I went to Mallory Park.

Hope to be around in '72—Swift mounted!

Regards,
Brian Wolley

QUALITY NOT QUANTITY

After reading 'Potty' Chambers informative article on Scott lubrication, I have only one point that I could criticise and that is the statement that we should use any old cheap oil with a high Pilgrim pump setting. Although a high pump setting is required to enable this type of pump to run reliably, if driven at engine speed, the excess oil supplied to the motor ruins the performance (m.p.g. as well as m.p.h.) and calls for frequent decokes and Burgess renewal.

I first tackled the problem of gaining optimum oiling without the Pilgrim set too low in 1965 when I built my Scott engined, Douglas framed, Velocette gearboxed, etc. etc. Special. During my experiments I used a number of different oiling systems.

First System

This was the well-known cross-over system whereby a pipe is run from the l.h. sump to the r.h. main bearing feed and vice versa. The Pilgrim pump can then be placed in a more appropriate position—i.e. at the bottom of a tea chest and covered by other spares.

This system had two shortcomings, one being that the broken crank residue from one crank chamber was fed directly to the main bearings of the other. This was of course mentioned by Potty.

The second being that when oil from the sump was transferred to the main bearings on the other cylinder a certain amount of gas must also transfer.

This took the edge off from performance even if the pipe bore was kept small—ever tried to ride a modern two-stroke twin with a worn centre oil seal?

Due to these shortcomings I decided to try another system.

Second System

In this case I removed packing glands and fitted proprietory oil seals in their place. The crankshaft being re-shimmed to make up for the thickness of the glands. This meant that the oil-ways to the mains were not timed but open to the pipe unions all the time. To prevent blow-back and therefore gas loss ball valves were fitted to the crankcase oil unions. These ball valves were sucked up only when the crankcase was in depression. From the ball valves, plastic pipes were fitted to a "T" piece which had a small restrictor jet fitted into the single leg. From this leg with the restrictor jet fitted, a pipe was run via a filter to a small oil supply. Oil supply was found best to be either SAE 40 or 50. This system enabled me to retain a petroil supply for the bulk of the lubrication, but also to have a direct oil feed to mains and big ends partially. One useful point is that when the engine was stopped, the ball valves closed which meant that no oil tap was required and therefore the oil could not accidentally be left "turned off."

Material required:

Two oil seals, BSA or Bond wheel hub seals. (These press into the cups and fit the shaft without any machining or other modification. A blob of Loctite helps to retain them).

Two thick shims. I used soft cadmium plated washers, and the cadmium was not even worn after many miles.

Two ball valves. I used the type from Velocette oil tanks.

One petrol line "T" piece.

One restrictor jet. Size 25 "Tina" main jet.

One filter.

Three feet of transparent plastic fuel line (to enable oil flow to be checked).

This system worked well providing a good filter was used, and was in service for many miles.

During the time I was using these two petroil systems, I tried every type of oil that I could lay my hands on, from single grade 50 through to the special two-stroke oils. I found that using as an example SAE 40 or 50 of reputable manufacture at a 20: 1 mixture that I was running the risk of piston seizure if I attempted to cruise in excess of 65 to 70 m.p.h. (After thought—all testing was carried out on private property of course!)

All the oils I tried, save one, proved to be less than satisfactory. The biggest problem being the vast quantity of oil required to obtain reasonable results. That was until I tried the "save one" oil which was SAAB two-stroke oil. This oil is manufactured by the SAAB car people and imported by them. It is quite reasonably priced at about 35p per pint when you take into account that the recommended ration is—wait for it—50 to 1 ! ! ! i.e., 3 fluid oz. oil per gallon of petrol. I also found it hard to believe, but as the engine I was using was rather worn, I thought I should try it, be it at 40:1.

I therefore set out one September morning in 1966, I believe for a place called Evesham, at a steady 70. On arrival at Crown Meadows, after a trouble-free run, except for the usual headlamp bracket fracture, I removed both doors and lo and behold—no Hoggman Blues, but lots of clean oil. (Funny thing about that headlamp bracket fracture—the only time they give trouble was on my annual run to Evesham).

After the annual celebrations at the chosen hostelry, and feeling rather carefree, I dropped the ratio to 50:1 for the return trip to London. I pushed off and was soon cruising at 70-ish (which might be a slight understatement)—a most enjoyable run—non-stop, trouble free.

The next day I decided I must look inside the motor, but other things prevented this for a while. When I did eventually remove the doors, 18 months later, everything was still the right colour, so back they went until 1969.

This is when things took a turn for the worse, SAAB stopped importing their oil, but had an alternative manufactured in this country to be used at a ratio of 26:1. Result—after 3,000 more miles, ½" x ¼" big end rollers, with top roller plates to match (sob) but this is not the end of the story, for it came to pass that SAAB for some mysterious reason began to re-import their oil which is still available in 18oz. plastic bottles. (NB. Don't buy the canned 26:1 stuff!)

Third System

One of the arguments against the use of petroil on Scotts is that if no oil supply to the mains is provided, the glands and mains suffer due to insufficient lubrication. The glands need more oil than the mains and they therefore suffer the most. As I had removed the glands for system No. 2, another simpler system seemed to me to be worth a try.

All parts fitted for system two above the crankcase oil unions were removed including the ball valves and plastic pipes were run from each main to the transfer port covers on the same cylinder. NB. Not from the L.H. main to the R.H. cover and vice versa, but from the L.H. main to L.H. cover and from R.H. main to R.H. cover.

This meant that there were no packing glands, there was a clear passage from the hole in the back of each main bearing cup, through the pipe directly to the transfer port on the respective cylinders.

This system works in the following manner, on the down stroke of the piston as the transfer port opens, oily mixture is forced through the transfer passages into the cylinders. As there is now another small transfer passage up through the added pipe, oily mixture passes across the main bearing thereby lubricating them. (DON'T TRY THIS WITH GLANDS FITTED FOR OBVIOUS REASONS).

I tried this system for only a relatively short period, to make way for a 1929 two-speed Sports Squirrel, but it seemed to work O.K., as you could see oil stains on the inside of the transfer pipes. The petrol mix was again 50:1, SAAB oil concoction.

Now that I had the two speeder, I had to think again as I wanted to keep this machine fairly original in appearance anyway. I decided to keep the standard magneto platform mounted Pilgrim pump. What I was not and am not prepared to do, is to run this pump and engine speed. What I required was some way of reducing the speed of the pump to enable me to retain the 50:1 SAAB oil mixture and have a small but positive feed to the main bearings and glands. A solution was evolved, this being described below.

System Four

The answer to my prayer was seen leaning against a wall in Edgware High Street—a "Sturmey Archer" hubbed cycle wheel, which I picked up quickly and conveyed to the local Wimpey Bar. My newly acquired prize was placed alongside my brief case, much to the surprise of the waitress. On arriving home, the hub was stripped to reveal an epicyclic gear, parts of which used to fabricate a 3:1 reduction assembly. This unit is quite simple and easily made. A 60T female gear being mounted directly to the pump spindle, and a 20T pinion being mounted on a special sleeve nut to replace the normal magneto sprocket nut. As the pump was now running at 1/3 engine speed, no extra bearings were found to be required to support the gear.

With this reduction the original rotation of the pump is maintained.

The gears were found to ve VERY hard and no wear has taken place in them in two years hard usage. They can be lubricated with "Linklyfe" which is retained by the female gear.

I have found by the acquisition of quite a few hub gears, that it is possible to make a similar unit giving a 4.28:1 reduction. In use, I have found that the pump drive is reliable and the pump settings hold much better.

For those who are concerned about gearing down so low, I think that you will find that it is quite practical to gear down even lower, and still have sufficient adjustment on the pump for adequate oil supply with or without petroil.

Dare I suggest two combined 3:1 Sturmey Archer based units to give 9:1 overall?

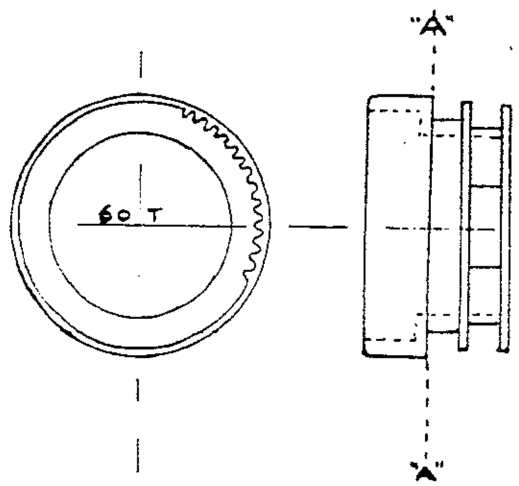
In my case I set the pump at what seems the minimum 100% reliable setting of four gurgles to one blob (equivalent to 12 g's to 1 b.) and use a petroil ration again of 50:1 SAAB oil. (Oil to pump any rubbish). With this small amount of oil around, I find the Scott performs cleanly, fairly speedily, and very economically. Petrol consumption is much the same as the Special, being around 70 m.p.g., cruising at 65-70 m.p.h.

Like Potty, any comments or criticism of the above, I would like to see IN PRINT in Yowl.

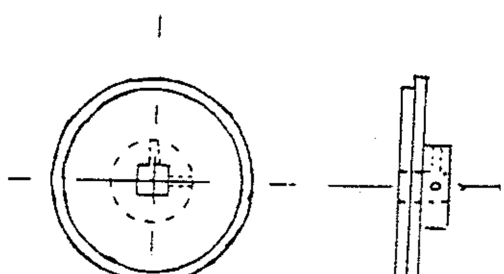
Yours,

Dennis Wray

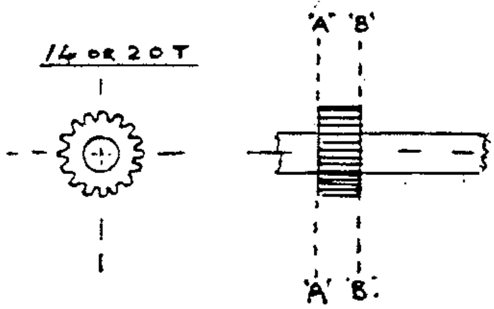
SYSTEM 4 STURMEY ARCHER BASED REDUCTION GEAR



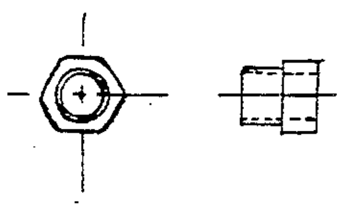
Modify S/A female gear by slicing off through "A"-"A" with thin cutting wheel and grind flat.



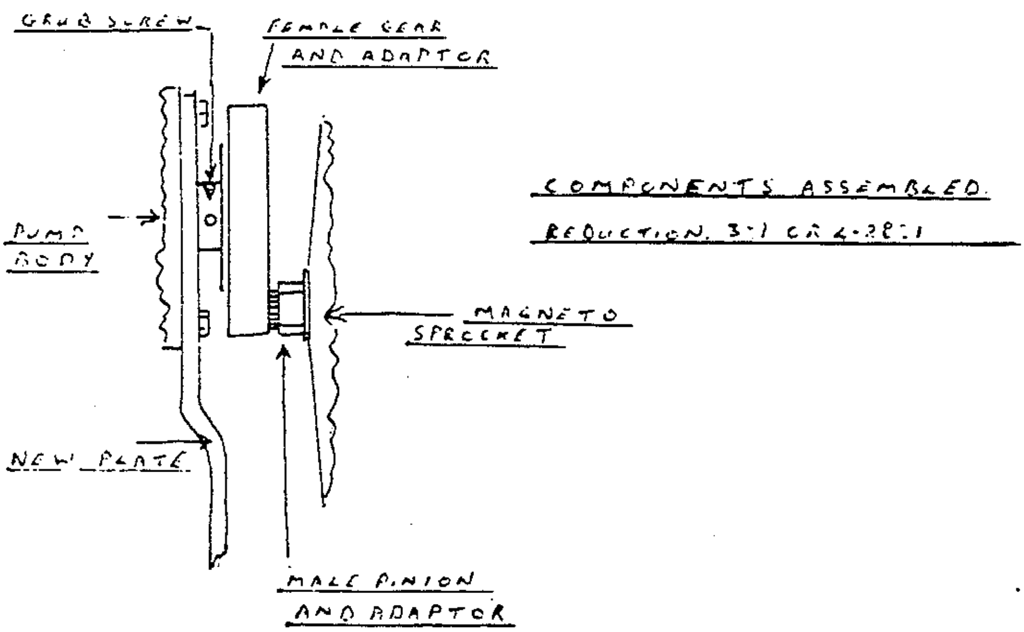
This part to be made and pressed into female gear. The centre hole is to fit the pump spindle with 2 x 4BA Allen Grub Screws to lock it. The two parts should be tack brazed together after pressing up.



Modify wheel spindle by slicing off at A-A and B-B. (Use this pinion and not the loose ones) as the slicing off process exposes the soft core which is easy to drill. Bore out centre to max. safe limit.



This part to be made up and pressed into the male pinion. The two parts tack brazed. The assembly replaces mag. sprocket nut.



All that is now required is a new pump mounting plate to suit pump position. Slot plate mounting holes to enable mesh of gears to be set. Allow just a little free play in the teeth at tightest point. For those Scotts fitted with magnetos and crankcase door pumps, please fit the pump to the mag. platform as it is then away from the heat of the engine, and will be found to hold settings better.

Lubricate gears with Duckhams Chainguard or Linklyfe—it won't fly off.

OIL AGAIN

Dear Editor,

I read with interest the article on oil pumps, etc. in the January issue of Yowl. When I bought my first Scott in 1965 (a 1950 model) 596 c.c. KXJ with coil ignition the oil pump was pumping too much oil into the engine. These pumps are not adjusted in two minutes, and it took two months approximately to get it set right. After that is was not adjusted again and proved very reliable. I had this bike on the road every day for two years. The engine was not touched at all, and all that was spent was for two brake cables, one thrust race, one rear tyre and one pair brake linings. The engine has done over 20,000 miles and has not been stripped and is still in good condition, so it proves that if you keep your oil clean and spend time in adjusting the pump, these can be reliable engines.

The only trouble I see with Scotts are that they are too low geared in top and too high in bottom. It is a pity that Matt instead of building experimental engines, used the 1950's engine and made a five of six speed gearbox with a higher top gear. The trouble with fitting a Velocette gearbox is that the top gear remains much the same as the Scott, so this is not much help.

By the way—when I bought the Scott, it only cost me £20 with M.o.T. taxed, and tank full of petrol! It was advertised several weeks before I bought it, no one was interested down here at the time in Cornwall.

I also own a 1920 Scott, 1929 Flyer and 1959 596 c.c. Regd No. 777 AOF. (Picture of this machine in Made to Limit Guage).

Yours,

C. Williams

If one subject is guaranteed to get an immediate reaction it is the one very large subject covered by the rather short word oil.

First let me say one thing I do agree with P.C.'s article—Silkolene Super 2/40 is the best oil for road work. We were actively involved with some major oil firms last summer when some of our customers ran into trouble. The first point backed up by a major oil company's admission is that 40 SAE is the lowest rating with preference after SAE 50 (straight oils). Secondly on *no account* must petroil oils be fed through the pumps or an expensive visit to the menders will be called for.

For some time I've threatened a boring article on "lube" so here you are:—

Silk pumps do not rely on "suck"—do not have a high output (whatever that means) to the best of my knowledge have no bleeds, feeds, meterjets or any other such complications. The plain facts are as follows.

The engine "sucks" at low r.p.m. and this feature decreases as the revs increase. Therefore the pump (any pump) must pump as the r.p.m. increase. In our case using neoprene seals and flapper valves, the "suck" is over

180°. The pump internally is constructed so that the oil to each cylinder is equal—one must bear in mind the basic research and development on track and road all I can say is that the delivery is very similar to each crank chamber—whichever chamber we investigate the amount in the sump is the same. This is either with or without a conversion.

Our pumps work on very similar principles. Firstly like the B & L they are a piston pump, the beauty of which work on a full cam 3/16" during all delivery conditions. The ports in the revolving cylinder are uncovered in relation to the maximum cam lift, i.e. by this matching the ports the pump will deliver by hydraulically only as much as it takes in (very two strokey).

This is fine and in service that standard AA 1030 pump gives no trouble at all—neither does it do any more than a reliable Pilgrim except to do it more reliably for many more years.

Thus we realised fairly early on that if any serious improvement to the Scott Lube was to be made then we would have to capitulate to Velocette's superior design features on the 1930 G.T.P. and link the demand to supply on the throttle. Our interim idea was a Town and Country manual advance/retard link which is really effective if a bit vintagey. It has taken three years to develop a pukkah T.C. oil pump—but it does work, 400 miles to the pint, perfect lube ALL the time, minimum pollution problem (you try selling bikes in America!) cleaner silencers, etc.

Well you can argue all you like, but Mavro started it, we took it up, simplified it and in five years hard labour (Mr. Williams has a strong right arm) we have seized once on the new bike this year, the head lifted and water replaced the oil with rather dramatic results at least it seized all the way round the piston!

On the subject of the modern racer it might be of interest, the developments that have taken place since the last Rally.

Firstly our big end cages are a resounding success, weighing ½oz., and silver plated they carry ten ¼" diameter 5/16" wide rollers. The bearings and rollers look exactly the same the day we put them in. Proof, the crankcase used to run hot, now it is cool—friction?

Snag is they cost a lot to make but Roger Moss and myself have our heads together. More exciting still, is that immediately the open pipes were discarded and Dave Midgeley's siamesed expansion chamber fitted, the revs (pulling the same gear) rose sharply from 5,200 to 7,500.

In practise at Mallory, the Scott with little effort held and gained on a very quickly TD2 Yamaha. The sound has to be heard to be believed and the band stretches from 3,000 to 7,500. We believe that if we can get the rest reliable that Club and Nationals might be within our grasp. We must do something about that wretched Velo clutch—the power has stuck it well and truly together!

If it's Scott then please don't hesitate—Tom, Maurice, Stewart, the other two Daves and myself WANT to know.

Yours,

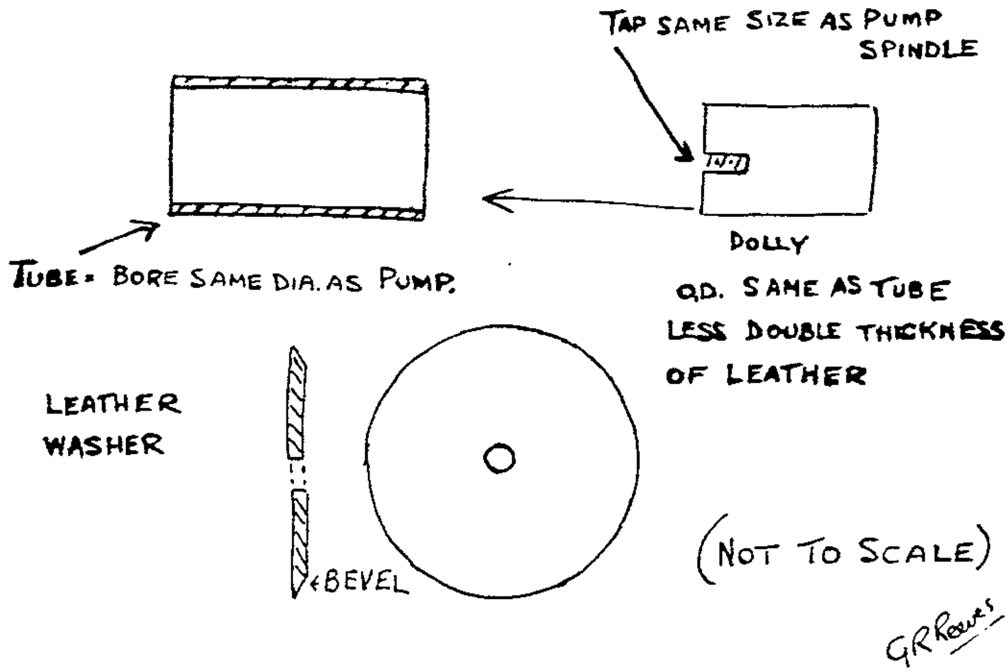
George Silk, Jnr.
(Silk Engineering)

REEVES (W)RINKLES

Two Speed Owners

Drill and tap ¼ B.S.F., the head of the hollow bolt and fit a grease nipple. Then at the start of a run, inject a generous amount of engine oil. This gets the oil to all bearing surfaces better than the hand pump, especially if the machine has been standing.

Of course, the hand pump is ok when riding.



Hand Pump Leather Cup Washers

Needing some leather cup washers for my 2 speed hand pump and being unable to find a stockist, I made some as follows.

You need a piece of tubing the bore to be the same as the pump bore about two inches long. A Dolly, diameter same as bore less the double thickness of the leather used drilled and tapped to suit pump plunger. Some leather about 3/32in thick and about 1/8in to 3/16in larger than the bore of the pump, and bevel the edge.

Soften the leather in hot water, fit on to the dolly with a washer, bevel edge nearest dolly, then push dolly with leather affixed through the tubing. I use a vice. Now you have a cup washer.

DRIPPER FEED SIGHT GLASSES V12/5 Aug. 1981

If you need to replace the glasses in the drip feeds, and you cannot get hold of the proper things, these can be made from hypodermic syringes of the right size, even though plastic. The make you need are Gillette, as most other makes are not clear. You cut out the length you need with a junior hacksaw and face up to the length you need. You can then mask off where the scale runs up the side and paint white.

I managed to get hold of some from a local nurse, as they are used once then thrown away. I will send on to Norman Pickup the remainder that I have. You can obtain them from him, as I know many members may have problems in getting them.

One other point that comes to mind — it may be of interest — I have used a small electrical grommet cut in half to seal the gland nut on top of the drippers, and tighten the gland nut down until I can just turn the adjusters.

I have had no problems with leaks. Jim Best.

OIL PUMP SAGA

V3/5 May 1963

BY

M. N. MAVROGORDATO

(Editorial note: "Mavro" will need no introduction to Scott enthusiasts. He helped me enormously with details and pictures of his Scotts, 1926-63; and I could not help but note, while examining several dozen old photographs, that all his machines featured just one large Best & Lloyd oilpump—never a Pilgrim. Having strong views about the utility of the simple T-piece which appeared on factory Scotts fitted with B & L pumps, I wrote to Mavro and asked how he managed to ensure even oil distribution — for I was certain that he wouldn't use that awful idea! (After 1926, remember, he was never put out of a race by engine trouble ......) About three months' correspondence followed, and the end-result is this excellent article. Apart from re-arranging and re-drawing the illustrations for efficient, economical reproduction, I have used the contribution "as writ". If only I had known of this splendid idea ten years ago...... before I grew resigned to living with the duplex Pilgrim! Pardon me...... I'm off to find an old B & L tell-tale!)

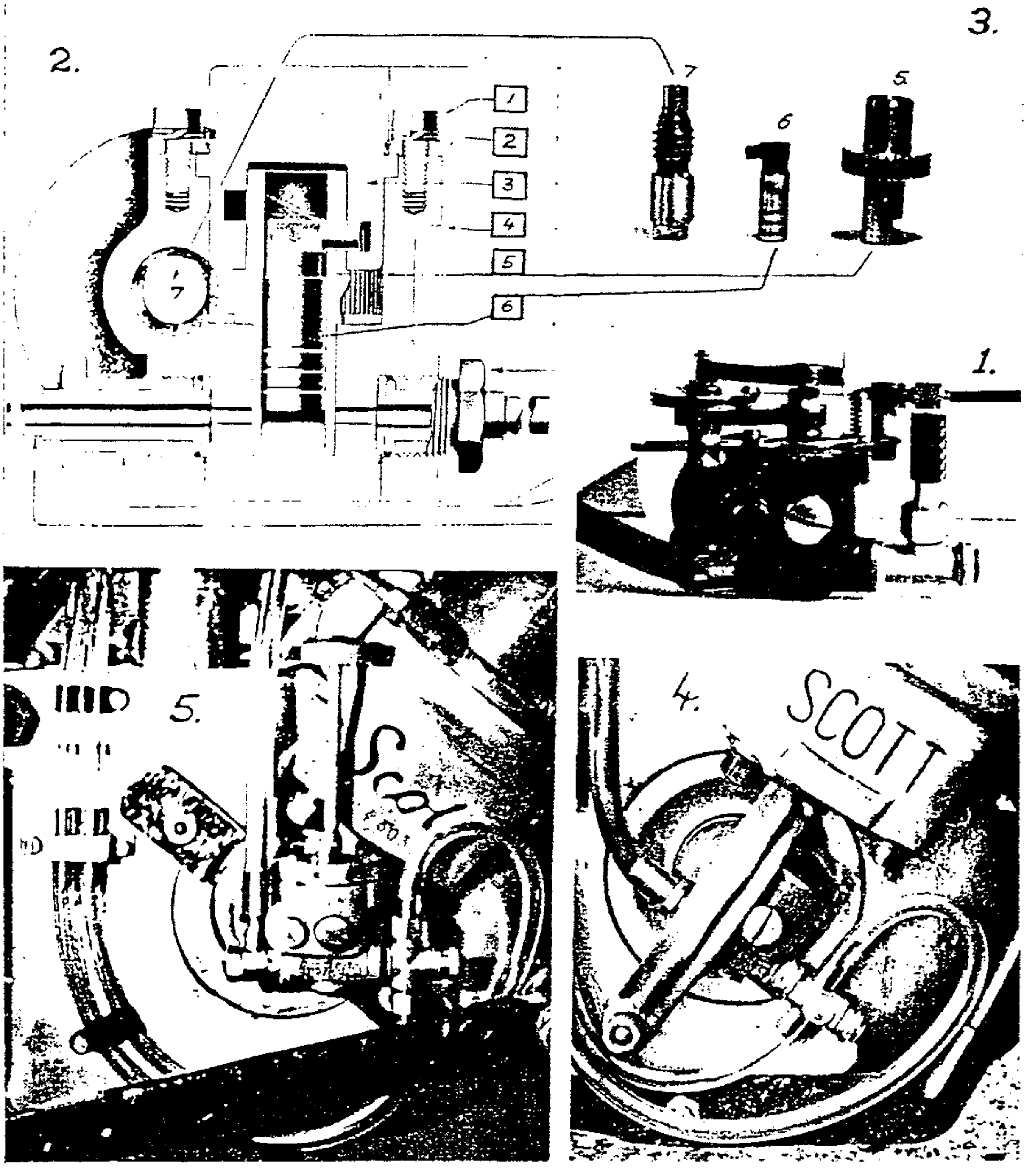
Of all the numerous mods. to the Scott lubrication system I have seen, is undoubtedly the best. If we must have an oil pump—let's have a good one. One like this.—Ed.

It was after a bad seizure during the 1926 Amateur T.T. race that I became interested in Scott lubrication. There seemed to be plenty of room for improvement.

My 1926 T.T. machine was fitted with the large Best & Lloyd Mk II oil pump. Since a Scott needs little oil when running slowly, but a very large quantity when travelling fast, it seemed to me that a throttle controlled oil pump was the obvious answer. Accordingly, during the Winter of 1926, I devised the affair depicted in Illustration 1.

The "pulley wheel" round which the thin cable passes is mounted eccentrically to the small gear wheel to which it is fixed, and which engages with a larger section of gear wheel attached to the regulating block of the oil pump. The effect of this eccentricity was that, as the throttle was opened, so the oil pump was opened comparatively and progressively more than the throttle. The amount of eccentricity was adjustable. The cable (which, in actual fact, was strong sea-fishing gut) joined the throttle cable in the usual junction box. This contraption worked quite well, and I used it for 6 months of fast touring with no trouble. But I decided it was ugly, and à la Heath Robinson; and in any case it did not takle the real problem, i.e. even distribution to each main bearing. So I took it off, and threw it into my junk box, where it has remained ever since—till last week! (March, 1963—Ed.)

It was when, in 1927, I got my next Scott, a replica of the 1925 2-speed T.T. racer, that I was first introduced to the Pilgrim Duplex oil pump. Although it had the advantage of delivering a definite flow of



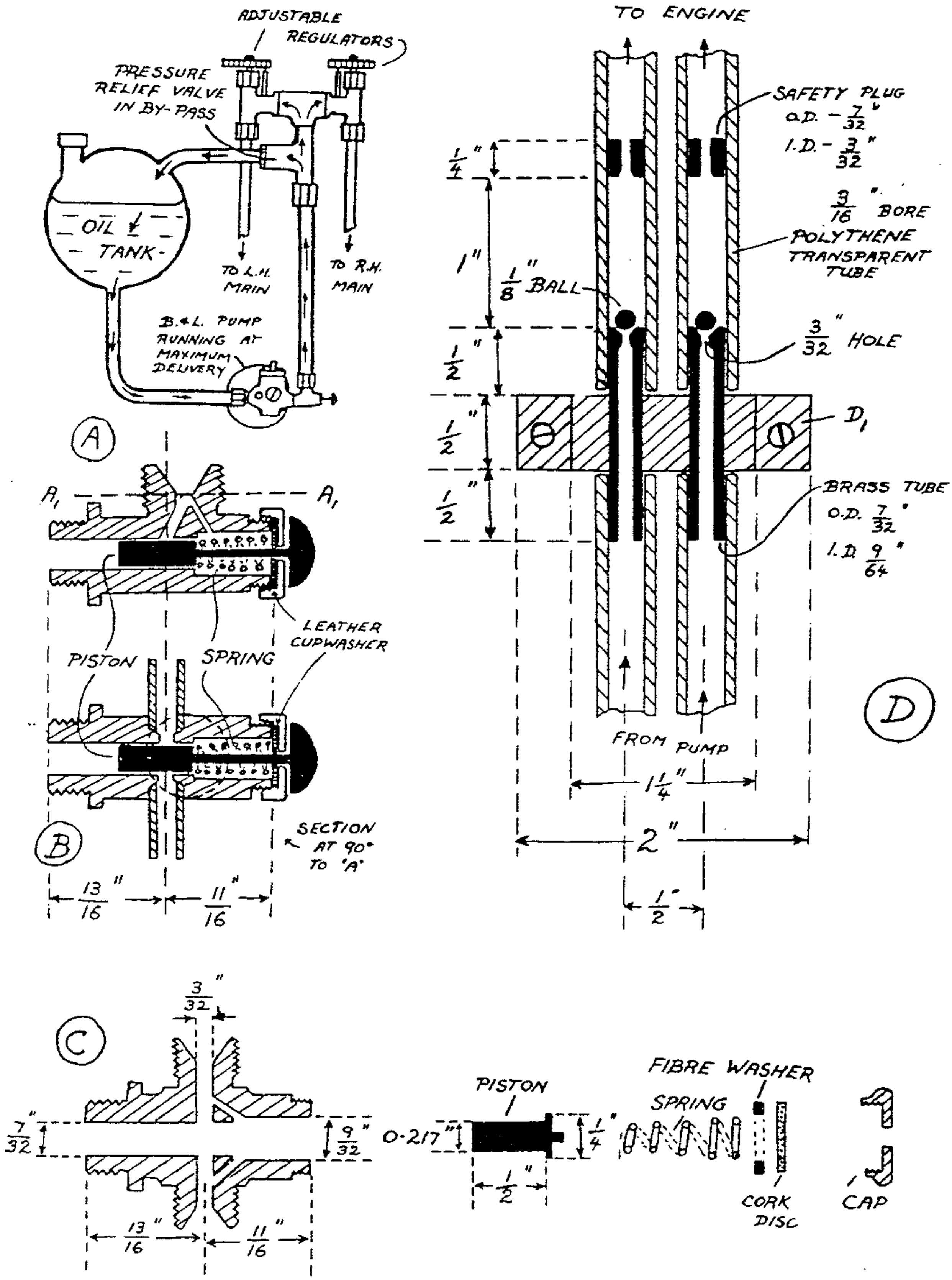
Illustrations referred to in Mavro's article. Picture 2 is a cross-section of the Mk.II Best & Lloyd pump, and the key to the boxed numbers is as follows: 1 - 5/32" Whit. screw; 2 - Fixing plate; 3 - Regulating block; 4 - Pump body; 5 Gear wheel and cylinder; 6 - Steel piston; 7 - Driving worm. Un-numbered arrows refer only to washers and unions.

oil to each crankcase it was in every other respect inferior to the Mk.II Best & Lloyd. It was full of little springs and balls and fast moving parts, the cams appeared to be made of some material not unlike cheese, and it did not give a reliable performance. In other words, I "didn't dig it" at all; and fairly soon removed it and cast it aside. I replaced it with a Twin Mk.V Best & Lloyd, which was a very good pump indeed. For the benefit of those who do not know the clever principle on which the B & L works, here is a brief description. A comparatively large piston is made to rotate and reciprocate in a cylinder by means of a lug, which forms part of the piston. The lug moves in a fixed inclined groove, and slides up and down a slot in the cylinder. The rotary movement is imparted to the cylinder (and piston) by means of a worm wheel (forming an integeral part of the cylinder) and worm. This effects a gear reduction of 1 - 35. Instead of ball valves, there is a slot or port in the rotating cylinder which registers with the supply port on the ascending stroke of the piston, and with the delivery port on the descending stroke. The flow of oil is regulated by turning the block in which the cam groove is cut. This has the effect of altering the "timing" or phase of the piston stroke in relation to the opening and closing of the supply and delivery ports. All of which, no doubt, is as clear as mud! Although it is such a simple device—there are only 3 moving parts—it is not easy to describe. A study of Illustrations 2 & 3 will help. (If this doesn't "get through" to you, dismantle an old one or look up the fully illustrated original patent spec.—Ed.)

In my view, it is essential on a Scott to be able to regulate the oil feed while riding; otherwise one proceeds through towns followed by a smoke screen, or else seizes the engine on the open road. It is impossible to adjust satisfactorily, from the saddle, the two feeds of a Duplex pump; particularly when the latter is driven off the magneto.

So my next experiment took the form depicted (diagramatically) in the top left-hand sketch, which I think is self-explanatory. The Best & Lloyd was set permanently full on. There was a by-pass back to the oil tank via a spring loaded relief valve; and an adjustable drip feed to each crankcase These drip feeds were fixed conveniently fairly high up, behind the radiator; and, being under pressure, could, of course, be made to deliver an exactly equal amount of oil from each. But, even so, I found it fairly difficult to make these two adjustments while riding, without charging into the nearest ditch. I toyed with the idea of coupling the two adjusting knobs together with a tiny chain; but eventually discarded he whole project.

When my beautiful Manx G.P/Sprint Special arrived from Shipley in the Spring of 1930, there were two immediate problems to tackle before taking her to the I.O.M. for the Manx Grand Prix: the foot-change and the lubrication. The former consisted of a very non-positive type of Sturmey-Archer foot change and I could not see myself putting in any very useful laps, in view of the numerous missed gear changes which I would undoubtedly make, quite apart from the unwelcome concentration which would be needed. By a stroke of luck, Messrs. Veloce had in the previous year brought out their positive foot-change, which anybody could buy for the princely sum of fifty shillings — so I grafted this splendid piece of mechanism on to the Scott "gate". It has worked extremely well ever since, with no attention whatsoever, and gives a delightfully "soft" change, since the actual selection of the gears is spring loaded, thanks to the retention of the Strumey-Archer device. The whole thing can be removed from the gear-box by undoing two nuts, and taking out one cotter pin. (This modification is greatly superior to the factory version—adopted after correspondence with Mavro! It will be described and illustrated in a forthcoming article—Ed.)



But I digress from oil pumps.

By now it was quite clear to me what was wanted; and I listed 3 main requirements, as follows :—

1. A good oil pump, with a single adjustment which could be made from the saddle.
2. An equal amount of oil delivered to each crankcase.
3. Simplicity, reliability, and good looks.

I considered fitting 2 small "Baby" Mk.II Best & Lloyds, one on each crankcase door; and coupling their regulating blocks together by Bowden cables, junction box, and single lever on the handlebars, This, however, did not satisfy Requirement 3. Therefore I fitted the well-tried single large Mk.II Best & Lloyd on the R.H. crank-case door. The regulating block was fitted with a small handle, and was left free to move by replacing the standard 5/32" Whitworth locking screws with longer screws and springs. To meet Requirement 2, I devised a very simple scheme, which worked perfectly from the beginning, and has continued to do so during over 30 years of mixed racing and touring—**no smoke screens, and not a single seizure.**

When the Scott Company fitted the single Best and Lloyd pump, they employed what was virtually an ordinary T-piece, from which oil ran into each crankcase; but obviously could not be guaranteed, nor even expected, to run in equal quantities to each side. My "brainwave"—if anything quite so obvious can be called that — was to modify the B & L plunger type of tell-tale to act as an oil distributor valve. (The Scott Company's approach to the problem was somewhat different, when about 3 years later they unveiled to an astonished world that fantastic throttle-controlled swashplate pump—surely from the ridiculous to the sublime! It hardly met with my requirement number 3!)

My "distributor" was made as in sketches A & B, which show the standard B & L tell-tale and the "Mavro Distributor" respectively. The original union was cut off across line A1A1, and a small brass plate was soldered on to blank it off. Untidy threads were filed off. Note that the oil bleed is left open. At 90° to the original union, a 3/32" hole was bored straight through the body of the tell-tale, as indicated by the dotted line This hole was then counter-bored on each side to take two brass tubes, ½" long x 7/32" o.d. x 9/32" i.d., which were soldered in. Flexible 3/16" tubing was forced on to these tubes.

When the pump is in action, the 3/32" "ports" are uncovered simultaneously by the small brass piston; and as the oil is under pressure between this piston and the main piston of the pump, an equal "squirt" of oil is forced through each "port". The "distributor" piston then returns, and by shutting off the "ports" acts as a non-return valve. It is, of course, essential that the two 3/32" holes are exactly opposite; in other words, that the hole is bored accurately at 90° to the bore of the distributor. "Precision" must be the watch-word here. I used a brass mandrel (7/32" diam.) which was passed through the body, and either end of which rested on a V-block. I was rather dubious about the soldered-on unions, but to this day they have never come unstuck. This device can be seen in illustration 4, fitted now to my 2-speeder.

About 10 years ago I decided to make a "De Luxe" model for the Sprint Special, and this can be seen in illustration 5. It consists of the old faithful Best & Lloyd pump, with an improved method of regulation; a "distributor" made from the solid, with two normal unions; and an amusing new form of sight feed, which was cheap and easy to make, thanks to the introduction of transparent plastic tubing. (I can just imagine horror of the Concours d'Elegance brigade!)

It will be seen that the pump has now got a more accessible handle. In addition, there is a 3/16" spring-loaded ball, which registers with 3 shallow holes in the much thicker fixing plate, to give 3 positions:-

1—for slow or traffic riding.
2—for normal running on the open road, and
3—for ¾ to full bore work.

The principle and main dimensions of the new "distributor" are exactly the same as for the old original one—see sketch C. But the tell-tale button has been deleted, thereby eliminating all possibility of air leaks past the leather cup washer—and in any case we now have our jumping balls to tell us exactly what is going on! Note new design of piston, and 1/16" bleeds drilled into each outlet. Body, piston and cap are of brass.

The "patent" twin sight feeds were made as in sketch D. ½" square brass was drilled to take two tubes, which were soldered in, and the block was fixed to the R.H. crankcase wall by two 3/16" Whitworth screws (D1).

At each stroke of the oil pump's piston, the two tiny balls—they do not look all that small, as the plastic tube magnifies them—leap into the air, or rather oil, an equal distance, varying from 1/8" to ½", according to the setting of the pump. Any air bubbles in the tubes leading from the "distributor" must be avoided, since they make the balls behave like dancing dervishes; which is not the idea at all.

Cylinder wall oiling, in the case of both my racing 2-speeder (via hollow transfer port bolts,) and my Sprint Special, was taken care of by a spring-loaded hand pump in the bottom of the oil tank, operated by a lever on the handlebars, through Bowden cable. Adjustable regulators controlled the rate of delivery. I only used this for racing, and then only on the long straights such as Sulby Straight in the Isle of Man; and never at all in races at Syston, Donington and Blandford.

Footnote by George Stevens:—

Best and Lloyd pumps were invented and patented by Charles Dyke, of Birmingham, in 1921; and fitted in various forms to many vintage machines. Manufacture was eventually taken over by Benton and Stone Ltd., and continued until the outbreak of World War II. They were not reintroduced after the War, and the stock of spares was allowed to run down. Today, no new parts at all are available, but Scott riders who wish to try Mavro's system should be able to find old pumps and tell-tales. They were made in both clockwise and anticlockwise models; and one of the former, fitted to the nearside door, would bring the outlet unions to the rear and make a very neat job indeed. Such a pump will last a lifetime.

PILGRIM'S PROGRESS

by "*Lofty*" *D. W. Aris*

Smoke, smell, oozing oil and unreliability ; that's what we have inherited. And we can't blame Uncle Alfred either ; he had his ideas on lubricating his brain child, and they worked in a highly satisfactory manner, especially for his times. Since then, much has happened to that simple and elegant design ; some for the better, and some (witness the crankcase-mounted duplex Pilgrim pump) for the worse. It might be as well at this juncture to set down just what the snags with the oiling system are :—

(1) The pump needs very fine adjustment (more so when worn).

(2) The delivery does not vary with engine demand. (More oil is required when heavily loaded).

(3) The delivery varies with oil viscosity (reduced delivery when oil is thin)

(4) The delivery varies with temperature because of the different expansion of the pump components. In addition, temperature also affects viscosity.

(5) The combination of 3 and 4 guarantees excessive oil when riding on ice or in fog (cold conditions) and almost complete starvation on the motorway (everything really hot).

(6) Excessive build up of oil when in traffic. (The amount of oil transferred to the combustion chamber, and hence to the exhaust, depends on the gas flow, i.e., product of engine revs., and throttle opening).

(7) When oil feed for mains and bores is satisfactory the supply to small ends and big-ends is insufficient.

(8) In order to mitigate the effects of the foregoing, the engine is overoiled, especially around town. This builds up excess carbon on piston crown and walls which causes pre-ignition and "carbon seizures" respectively when the engine is called upon for Arterial, "Triumph just passed me," type performance.

(9) Owing to the enormous range of combustion chamber conditions, from oil soaked to incandescent, no one spark plug specification can cover it with a guaranteed performance for 2,000 miles without attention. Those otherwise highly desirable devices called "Lectra Fuel Igniters," get very choked with a typical Scott standing-start smoke-screen.

(10) Oil in the combustion chamber is always undesirable (but it does stop the exhaust pipe rusting internally).

There may be more . . .

It is quite unfair to blame the Pilgrim pump. It is being run at engine speeds far higher and at settings far finer than was intended. A petroil system solves a lot of problems but brings others in its place. Pipe sizes and packing glands have to be right and the engine can still "store" oil and blow out clouds of smoke. Carburation seems less smooth, and the exceptionally good two-stroking of the Scott power-plus motor (when properly timed) has been absent on all the petroil jobs the writer has come across. What's more, a 3½ gallon fill-up from a hand-cranked petroil pump can take a week to complete and costs a bomb.

I suppose, to be quite fair, the pump mounted on the magneto platform was a reasonable device in 1928. It needed occasional adjustment and you had to watch the oil grade, but otherwise it was not too bad if you did not hang about overmuch. A descent of an Alpine pass for ten miles or so, however, could be guaranteed to blanket the village in the valley when the throttle was once again reopened ! Is this an unreasonable criticism ? Surely it is not what people expect in 1965 ; and to the traditionalists the writer suggests that Alfred Scott, with his ideas always ahead of his time, would not have allowed it either in this day and age.

How to overcome the difficulties has been the goal of the writer for some years past and various systems have been devised, either to solve specific problems, or to gain information. The first was a mechanical linkage between the oil-pump plungers, aimed at providing a quick synchronised change of setting of the two feeds. It helped quite a bit on Alpine passes and in the Blackwall Tunnel ; but various factors, such as drift of the settings from wear and temperature, showed that the intended next step of linking the system to the throttle was quite impracticable. It was decided that the drive to the pump must be via a reduction of between 2 and 4 to 1, but no suitable gear-box was available. The making of such a device might be childs-play to the bright boys of Brum, but presented one or two difficulties to the writer, a humble Electronics-Systems Engineer.

A further experiment also yielded interesting results. The crankcase wells were fitted with outlets at the side which carried ball-valves and filters. The rearmost locking screw was removed from each crankcase cup and the hole drilled through and tapped 4 BA. A small pipe was fitted to each and coupled across to the opposite ball-valve unit. The idea was to keep oil circulating between the two halves of the engine, thereby increasing the flow to the big-ends and preventing build-up in the crankcases. The system worked, but there were snags. If the pipes were made large the gas-exchange reduced engine power at low revs. Alternatively, if the pipes were made small, the system worked until by chance the oil built up too far so as to submerge one ball valve. The oil viscosity and mass then prevented proper functioning and all the oil finished up on that side. A drain-out and plug change was sometimes the only cure.

Early in 1965 it was decided to carry out an investigation of the Scott lubrication problem. A transparent crankcase door was made and observations from here showed several interesting things. The oil, for instance, escapes largely from the back of the crank at a point a few degrees before T.D.C. It rushes straight up and and heads for the gudgeon pin area. It runs back down the crankcase walls and the blast of the gas displacement of the big end throws it about a bit. It never seems to go near the small-end again. Motors were "belted" and stripped whilst still hot. Small end starvation with normal oiling was confirmed. Experiments with tiny plastic sachets fitted onto crankpins were carried out on a bench and showed that the efficiency of the knife-edge crank was low as far as oil pick-up was concerned. It gets better, however, when the main-bearing feed rate is increased, and soldered-on "knibs" of copper foil improved things quite a bit more.

A 1 pint oil tank was constructed and fitted. The crankcase drain plugs were equipped with tiny flap valves and an empty "KIT-E-KAT" tin was fixed beneath each on a quickly detachable bracket. The machine was driven daily to work at different speeds and throttle openings and the oil consumed was measured. The oil "recovered" in the tins was also measured after being cleared of petrol. The results were interesting. With the oil pump set at the ludicrously high rate of "one in three" (good old "Guv." !) the proportion recovered was 60-65% at a maintained 70 m.p.h. (¾ throttle) and 85-90% at around 30-40 m.p.h. in traffic. When left ticking over the engine seemed to manufacture oil.

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Oil that had been through the engine came out about 10.S.A.E. thinner than when it went in. To test the suitability of this oil it was put back in the tank over and over again. The engine was "belted" and stripped again but lubrication still appeared to be reasonably O.K., much better in fact than with normal adjustment (1 in 6) on the conventional oil system.

The answer to the whole problem seemed to lie in some sort of scavenge system wherein the feed to the engine could be made sufficient to cover every kind of condition ; the excess being removed from the crankcase and recirculated. Such a system has several fundamental snags of its own but, when it is applied, automatically turns some of the failings of the existing system to advantage. The next article will describe what these snags are and how they have been overcome.

V4/11 April 1966

PILGRIM'S PROGRESS (Part 2).

by *Lofty Aris*

When the Writer first set out to crack the problem of properly lubricating the Scott, he had in mind the satisfactory solution of his own personal problem. It mattered not that his Scott might be very special inasmuch as unrepeatable components might be used to obtain the desired results. It soon became obvious, however, that if real success were achieved (necessarily at low cost) it would be a hollow and rather selfish victory if it could not be shared with all the other Scott Owners who might be interested.

The system employed was, therefore, shaped around as many original Scott components as possible and all modifications were of the "reversible" variety.

It could reasonably be stated, at the 3,000 mile point in the proving trials, that the scheme was a success ; no lubrication problems having occurred. The pump window was completely obscured by road dirt, there being no need to look through it, and the engine was incomparably smoother even under heavy fog conditions. The time had come to reveal the details in *Yowl*, so that we should see as many smokeless Scotts as possible at next year's T.T. Part one of this article duly appeared in the October issue, and the second instalment was got under way for December. It did not appear. So, particularly in view of the remarks in paragraph 1, the Writer wishes to offer his most humble apologies to all enthusiasts in stating that, for the moment at least, a full detailed description cannot be given.

An (almost) lone Scott buzzing about a town like Southend is bound to attract attention ; and it was not long before many old hands, now retired from motor-cycling, were advising the writer that he was on the brink of saving up for a re-bore. It was the absence of smoke and the grey innards of the tail pipe which attracted the attention. Amongst those interested were some two-stroke enthusiasts who use such engines for Road-racing, Hydroplane racing, Scrambling etc. Interest in the oil scheme was considerable, and at the moment certain aspects of it are being examined for the purpose of patent applications; since on study it could be applied in a modified form to other engines—particularly to two-stroke cars. This means that the principles involved cannot be publicly disclosed until the matter is settled one way or the other. The intention still remains, however, to get as many Scotts as possible equipped with the system by way of extended field trials. A local Dealer, Mr. Len Pease of the Pease Motorcycle Emporium at Leigh-on-Sea, is now riding a converted Scott using a modified and rather tidier version than that of the writer. The results will shortly be coming from that quarter, and it is hoped to equipped yet a further machine fairly soon. Many Club Members will have gleaned a fair amount of information for themselves either at the Isle of Man or the Rally last year. It is felt that these people, and indeed all Scott Owners, would like to know more—even if a complete description is denied them.

The Pilgrim Pump is retained, driven in the normal way. Both halves of the engine are fed from the outside half of the pump via a "splitter" block. This has been done before, but usually fails because at low rates of feed one half of the engine gets the oil and the other half gets the bubbles. (Pilgrim pumps deliver more air than oil). On the "Loftus" scheme, however, the pump is set at "1 in 1," and even if the oil division is not equal, the worst served half of the engine will be getting more than it could ever digest before. At this setting the pump is perfectly reliable under all conditions. (An old worn-out pump with the cams shaped up again has been used throughout the experiments). The surplus oil from the crankcases is removed by the second half of the pump and used again. The problem of its recovery and re-use is rather a tricky one since it is heavily contaminated with petrol and crankcase vapour. It is probably this difficulty which has hitherto prevented the appearance of such a scavenge system. The basic problem has now been solved and present experiments are directed at tidying up details and gaining information on engine wear and oil consumption. The writer's present consumption is about 200 miles to a pint, which is well below the normal estimated figure of between 300 and 400. Most of this is leaking out of the main bearings (a problem aggravated by the high feed rate), but some rather doubtful joints in the return system probably account for the rest. The present "experiment" has been one of profound neglect to see if one can really treat a Scott like a side-valve B.S.A., and get away with it.

Using this system a Scott really can be subjected to extended doses of "moron-drive," providing one attends to the petrol, oil, air and water routine. The plugs keep clean, and constantly watching the pump and fiddling with the regulators become only hazy dreams (or dreams of haze).

At this stage, knowledgeable club members will be shaking their helmeted heads and saying that it cannot be done with the poor old Pilgrim as he stands.

This is true, of course, and modifications are necessary as follows: The screw is first removed from the edge of the mounting surface of the pump, thus revealing the cross drilling from the oil feed union to the crankcase side plunger inlet part. The hole is drilled out to a depth of 1/2 ins. and "tapped" 1/4 ins. B.S.F., finishing with a "seconds" tap to leave the last few threads a bit shallow. The oilway is now tapped 4 B.A. for a further 3/8 ins. with a taper tap and a 3/16 ins. long, 4BA grubscrew inserted and screwed home firmly. This blanks off the cross-drilling. A short length (say 1½ ins.) of 1/4 o.d. copper pipe is threaded externally 1/4 ins. B.S.F. for 1/2 ins. and screwed firmly into the prepared hole to make a second intake connection. The pipe should have some parallel grooves cut around the projecting part to form a seal with plastic oil tubing. (Threading is worse than useless). The pipe so fitted will just clear the crankcase door fittings on all coil ignition jobs and probably on the crankcase mounted "conversion doors." It is true to say that a good toolmaker could make a far better job than this but the scheme outlined works well and does not need special tools to carry it out.

There are a few things to remember for those who may contemplate modifications:—

(1) The driving spindle bush has a left-hand thread.
(2) The plungers must go back in the same bores or the pump will only work by being rotated it in the wrong direction.
(3) Plungers engage with the driving worm 180 degrees out of step, i.e. when one is on the top of its cam, the other is at the bottom.

(4) The cams on the plungers and end plates must have smooth contours. Any sharp steps should be rounded with a suitable file. (Late type pumps have steel pegs projecting into the bore in lieu of cams on the end plates).

(5) Clean out all swarf before reassembly.

The oil from the crankcase will not be drawn up by the scavenge pump unaided because of the presence of crankcase gas which destroys the "lift." Ball valves acting on crankcase pressure are used to perform this function. Each crankcase is drilled through from the outside wall so as to enter about 5/8 ins. from the bottom of the oil well. The hole is opened out and tapped 1/2 ins. B.S.F. and spot faced to provide a sealing surface. A small sub-assembly is screwed in each side consisting of a 300 mesh filter and a ball-valve. A miniature banjo union fits onto this unit and the pipes from the two crankcase outlets feed oil via a junction block to the extra pump inlet previously described. The scavenge pump adjuster is set so that the pump works at about full stroke, but it spends a fair amount of the time pumping a mixture of crankcase gas and oily petrol. The dimensions of ball valves and gas limiting jets are critical, as is the spring pressure. (The petroil conversion boys know all about the problem of pipe dimensions.)

The oil feed rate to the big and small ends is greatly improved by this system, but the big-ends never get the opportunity of a dip in the oil in the crankcase well. It would seem likely that Flyer engines, without the direct feed via the knife edge arrangement on the crank, would probably suffer from a dose of the Hoffman Blues through lack of big-end lubrication. The same could apply to a power-plus engine if the big-end bush should rotate and put oil-holes out of line. We shall know the answer when it happens : but it does seem to be the sort of thing which ought to be made almost impossible to happen by the basic design, or, as would seem necessary, modifications thereto.

Birmingham and Post-War Shipley Scotts have a separate oil-tank at about mid-frame height. Earlier machines had the tank at a higher level and this presents a bit of a problem at the moment. A vent pipe is required from the oil recovery unit and this must terminate above the oil level in the tank.

The problem is being studied with the help of Mr. Len Pease who has fitted both kinds of tank to his outfit to facilitate experiment.

The cost of the components required for the conversion has so far worked out at about £25 for a more or less "tool-room" job with corners cut wherever possible. Produced in a batch of about 100 the price could drop to half, maybe less. Wouldn't it be nice if the scheme became standard on new machines and all parts were stock items ? Birmingham might become a Smokeless Zone !

Come on a trip on a "Smokeless Special" by way of compensation for your (temporary) disappointment. Uncover the machine, adjust controls ; switch on and kick. First potover she fires. Well choked the night before, she does not hesitate (no fear of excessive petroil fouling plugs on starting). It's cold, so she does a few minutes fast idling on the stand whilst we fix our riding-gear ; then all aboard, into first and away. Time to check the road for ice, since there is no need to wind it up to clear the oil. Smoothly up through the gears, and finally fully open the choke at the half mile distance. Our route takes us along a fairly narrow road and a lorry is doing a steady forty in front, so we steam along in second with the exhaust like a ribbon of sound, not a blop to be heard. The moment comes to overtake and we're in the right gear ; an immediate surge of power and we sweep past to a tantalizing tune on the tail-pipe. Our bliss does not last long however. The patchy fog closes in and speed is soon down a crawl. It's freezing, too, and there's more than usual need for caution, so it's headlight on and down below ten in first. We continue for a mile or two like this but the engine continues to run sweetly. First gear can be retained indefinitely without need to avoid revs. to restrict the oil intake. This is where the benefit is felt most gratifyingly. Soon the fog is left behind and the motor picks up with an effortless hum once more. Here we are again on the main road, but almost immediately some lights are against us. We pull up respectfully at the white line, fairly near to the inside so that the latecomers who take advantage of our signal on the pad can nip by us on the outside. A lorry arrives to the "OFF" and croaks on the hand-brake ; but his diesel rattle is soon drowned by the baubling of a chequered mini which forces between us and the kerb. He winds down his window and flicks a nonchalant fag at the level of the black circle on his door. He watches, fascinated, as it is gobbled up by our carburettor. Meanwhile he hangs on the clutch, keeping time on the throttle with the latest from Radio London. He obviously has a touch of the conversions, this bloke ; and his intentions stand out a mile. He'll be off on the Orange and squeeze out in front, then whip over suddenly where his lane is obstructed by parked cars some way up ahead, and then hope to bid us a "Cooper's" Farewell. If it pleases his Mini-mind, let him do it.

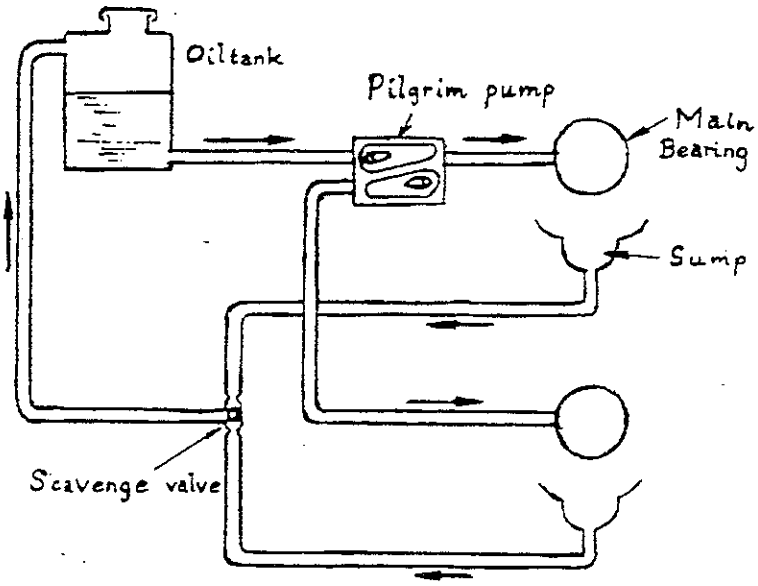
He's off! And then comes the Green. A sudden surge of acceleration as the clutch bites on first ; and as the Mini changes up the Scott comes alongside. Being a respectable Scott Club man we do not indulge in competitive motoring on the Highway, but this chap is really putting the bite on with a gearbox full of mild and chatters. Soon we must decide whether to brake up and let him swerve over, or move ahead. The thought of that fag ash is too much, best have him behind where he can't play silly tricks! A tweak to 3/4 throttle ; and with no excessive oil to blunt the full force of the 600 chuffers, the GROWL becomes a "Yowl." The rear chain twangs like a bowstring and hurls us through the forties at such a pace it cripples the chronometrics and cocks a scientific snook at the Sages of Smiths.

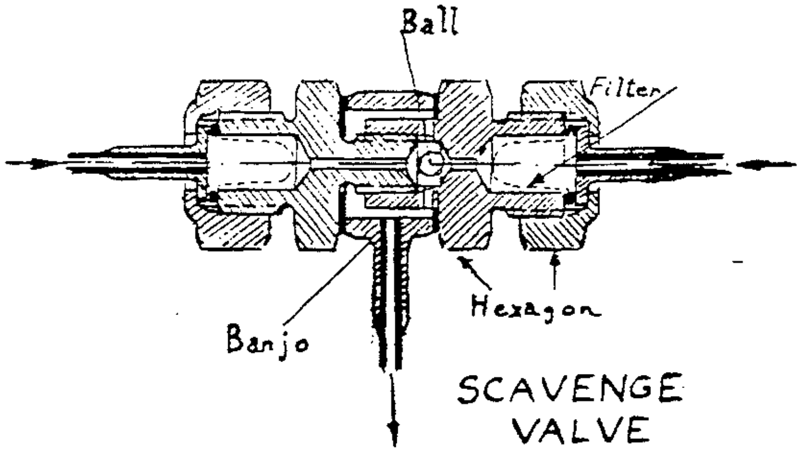
We throw away half the sweet song of second and drop into top at about sixty. It's some while before our hapless and hubless adventurer into speed passes us by with a not-so-sure-now bellow from his Burble-box. He's still trying ; and so we let him put up his 70 plus at a safe distance in front to open up the radar traps for us.

At the next set of lights there he is, blittering his uneven five-stroke "tick-over" and breathing out blue clouds of scalding sump oil. Meanwhile our Smokeless Scott burbles sweetly until the Green arrow permits us a quiet departure to the left. The last bit home round the lane is taken at twenty in top, so gently that we can almost distinguish the big-end rollers saying "slurp-you" as they receive their individual blobs of oil from the holes in the crankpin bushes. With the ignition retarded the neighbours don't hear us arrive, so we sit and listen for a moment. It seems a bit of a sin to switch her off, the music sounds so sweet.

What was it like before conversion ?

It seems difficult to remember !





Above: A pair of self-explanatory sketches by F. Linde, of Arnhem, illustrating his opinion of the working principle of D. Avis's scavenged lubrication system.

One possible drawback is that the maximum pressure developed in each crankchamber—some 6 lb. per sq. in.—would not be high enough to pump oil through the scavenge lines when the oil is cold and highly viscous. (On Swabey systems, remember, the effective pressure is doubled by synchronising high pressure in one chamber with low pressure in the other). "Lofty's" carefully-tested scheme apparently uses one side of the Pilgrim pump as a positive scavenger, and full details will be published once he has obtained patent protection.

SCOTT LUBRICATION

Glyn Chambers

We should by now, all have the message that SILKOLENE Super II 40 (Summer) and Super II 30 (Winter) *IS THE* oil for Scotts. Although I did notice someone treating us to the smell of "R" at the Rally, honestly, it's no oil for a Scott.

However, here are some other lubrication products on the market that may be of use.

GEARBOX. Castrol Grand Prix (expensive) or Silkolene OSMASTON 50 (much cheaper) for summer use. Silkolene DONNINGTON 40 for winter use, and don't overfill by checking the level frequently. It still leaks? Try Shell TIVELA Compound A — this is a thixotropic grease, very thick but as soon as it moves it turns to oil, but will not flow out of a static 1/16 gap. It cured all my gearbox leaks but has to be specially ordered through a Shell agent.

CHAINS. Many years ago I discovered the secret of long chain life on Scotts. Someone gave me a can of old but unused oil and I used ½ pint on the mag and primary chains before setting off on each trip. It made a H--l of a mess on the bike and garage floor, but extended chain life from an annual event to two years on the mag and three years on the primary, and after dropping Linklife all over the kitchen stove — I forget to put the little peg in — far safer. Now we have chain saw anti-fling lube. Fantastic stuff! I use the Silkolene product, but assume that others make one as good though not so cheap. Using far less oil than before, I liberally squirt the chains with it, rev up the engine and after the initial fling, no more oil comes off. A quick wipe with a rag over the bike and the rest of the oil just stays on the chains — amazing!

I now only lubricate the chains every two or three trips (depending on distance) and all for the same cost as a can of Super II. Should be available from any Silkolene agent.

Blobs and gurgles; lubricating a '29 Flyer

Dear Sir,

Further to my last article a few months ago entitled "Return to the Fold", I have persevered with re-building the '29 Flyer and now have this on the road after some minor setbacks. At one time I almost despaired but after fitting 18mm NGK A6 plugs the engine has not missed a beat. It's a pity they're Japanese but they really are good as regards not oiling up.

When purchased, the bike had been converted to petroil but, encouraged by Dennis Wray's article some years ago (copy obtained from the Club) I have fitted a Pilgrim pump, gearing down 3: 1 with a Sturmey Archer set-up. So far the system seems to work admirably, as the pump setting can be more easily controlled and it all fits quite neatly behind the magneto cover which I have cut away to accommodate the extra bulk. I presume that if the normal setting with the pump running at engine speed is, say, one blob to six gurgles, then I ought to have one blob to two gurgles as I am running at ⅓rd engine speed. I suppose the critical factor is how many blobs per minute. Could any member, who has a conventional set-up running at engine speed, help me here by advising me how many blobs per minute they get at fast idling speed which I suppose would be about 1000 r.p.m? One member has suggested that one blob every five seconds should be about right.

At the moment I use approx. one pint of Silkolene Super Two every seventy miles, which seems quite high but there is only a very light haze from the exhaust. I do get quite messy oil streaks from the exhaust ports down either side of the crankcase despite grinding the manifold flat to achieve a good fit, but I am loath to cut the oil supply down as the exhaust haze is by no means excessive. At the end of a run I usually check the crankcase wells and these are always just nicely full with clean oil.

If any member could help with these queries I would be much obliged. In the meantime I am enjoying my "Scotting".

Ted Hancocks

Ted Hancocks enclosed with the above letter a reply he received from Silkolene Lubricants to his enquiries about Scott lubrication and related matters. The following extracts are taken from that reply:

Dear Mr. Hancocks,

I would like to make the following observations which I think may be of equal interest to other Scott owners.

First of all, the additive system incorporated in Silkolene Super Two SAE 40 has several benefits in that it enables the oil to mix more readily with the petrol and also to provide a much enhanced load-carrying ability which protects the piston rings and cylinder bores more e: ectively. It also promotes a cleaner and more efficient burn which reduces the combustion chamber deposits and prevents ring stick. The additive also reduces port fouling and plug whiskering.

Secondly, the combination of the correct SAE 40 viscosity oil and the load-carrying ability of the additive provide excellent lubrication to the main bearings, etc.

The fact that we now include a dye in this lubricant is of obvious benefit to users of two-stroke engines using a pre-mixed petroil fuel; they can readily see whether the mixture is correct. The dye used is only likely to be objectionable if neat oil exudes onto painted surfaces where the ultra-violet effect of sunlight can cause lighter paints to discolour.

There should not be any benefit in using too much oil — the optimum fuel/oil ratio eshould be about 35/40: 1 although following rebuilds running-in should be effected at about 25:1.

R. S. Shead,
Technical Services Engineer,
Dalton & Co. Ltd.,
Belper, Derbyshire.

HOW MUCH OIL IS YOUR ENGINE REALLY GETTING?

Having been involved in Scott lubrication for a few years now, I feel that I should say a few words on lubrication, and perhaps I might help some Scott owners to get less smoke.

First, I have always cut the pump down as fine as I could, and put 50:1 oil in petrol. To run a Scott without oil in the petrol is like playing Russian Roulette, you'll get a seize one day. You know that the engine is getting the oil in the petrol, but you do not know how much oil is getting into the engine from the pump, no matter how you set the drips. The oil on the garage floor after a trip proves this. Also it seems to me that the faster the engine is running the less oil the engine can take in owing to the small dia. of the holes in the packing glands. This is another reason for putting oil in the petrol if you are going to do a long fast journey.

HOW I STOPPED THE OIL LEAK FROM MY ENGINE.

When I fitted electronic ignition on the left side of the engine I made a device to fit on the right side of the engine so that I could use a strobe, but I would have to remove the pump to do this. I did not want to do this, so I made up a small twin dripper unit, using clear plastic pipe to see the drips, this screwed up under the oil tap. I set the drips at 4 per min. each side and started the engine. There was no control of the oil at all. The engine seemed to be sucking the oil straight through. To stop this I drilled a 1/16" dia. hole in each plastic pipe in a place where the oil would not leak out. This gave perfect oil control, and also it stopped the oil leaking out of the engine, it's great not to have oil on the floor. I can only think that the packing glands 'flutter' letting the oil out, and the small holes in the oil pipes stop this.

Owners of Scotts with mag. platform pumps might like to know that I have been converting Pilgrim pumps into just a plain twin dripper. This helps owners who would like to fit a reduction gear but do not want to cut the alloy shield about. I use such a converted pump on my Scott. It's fitted on the crankcase door as normal and the engine sucks the oil up from the pump. The small holes that are already drilled in the rim of the pump window act the same as the holes I drilled in the plastic pipes. I set the dripper pump at 4 per min., each beak, using Silkolene 40. 50:1 oil in the petrol, using Esso two-stroke oil. With this set-up I get very little smoke and no pool of oil on the floor, and the great thing is, I can set the drips without having the engine running. One last word, you must have an oil tap. We must get our Scotts greener, I find that this method of lubricating the engine is the best I have ever used. It suits my style of riding, and is so simple to manage.

If any owner would like more details on this please write (S.A.E. please).

G. Howard,
7 Orchard Road, Bishops Stortford, Herts CM23 2AS.

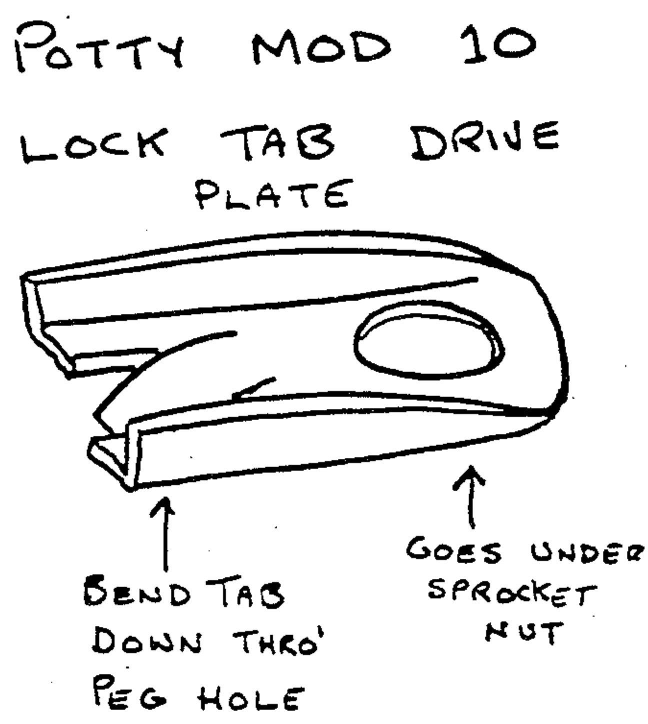
Potty — Crank Drive Problems

My very scruffy, much 'used and abused' old Flyer (henceforth referred to as the 'Nail') has done a large mileage over the last 25 years, and I have had few major problems with it. One big-end replaced (although another is now slightly worn), little ends replaced together with the gudgeon pins, and pistons rebushed. I am sure the big-end problem was only as a result of severe little-end play, perhaps as a result of my low oil feed policy?

A recurring problem has always been that silly little oil pump crank drive. I have worn out/broken/lost/bent numerous ones over the years and the addition of Gerry Howard's wonderful reduction gear (the first production one), I am sure, has put an extra strain on the horrible little object. However, we have been pushing back the barriers of (low) technology, and I pass on my astounding comments to the world:–

Stage 1. (do this or go straight to Stage 3). It has always been difficult to line up the driving peg with the hole in the magneto sprocket. I've taken ages to make sure that it is free all round one complete revolution — solution — I found that I had a 3/8" drive socket that fitted the magneto nut snugly and the O.D. of the socket was the same as the hole in the pump mounting plate — surprise! surprise! The adjusting slots will not line up with the mounting bolts. No wonder it was a pig to set up! File the slots sideways where the bolts should go and hey presto! The peg has now the same clearance in the magneto sprocket hole for 360°; this cuts down peg wear.

Stage 2. Although improved, the peg is still worn out at about 4,000 miles — answer, solder a steel nib (an old-type school pen nib is ideal) at the point of contact on the pin. Mileage is now 8-10 thousand before the peg breaks/wears/disintegrates/vaporises etc.



Stage 3. Potty Mod No 10.

A lock tab drive plate. This must be the simplest, quickest mod ever to do on a Scott like the 'Nail'.

I ended up with several worn-out driving cranks, all with short pegs that would not reach the mag sprocket. I made up a simple stainless steel tab in such a way that it would drive a short peg. Alignment does not matter any more. The short peg just touches the vertical side of the tab. Very little wear or stress takes place.

Stage 4. B.M.'s curse and the Final Solution?

I had, a few days before, been discussing chain with our Hon. Ed. about some chain failures with Wipperman chain on racing bikes. Although I have had no problems with the two Scotts I have equipped with it, when I had to remove my magneto on the 'Nail' to replace the slip-ring for the second time in 25 years (it just ain't good enough!) because a set of carbon brushes were not lasting 600 or 700 miles, as a result of the step in the worn groove. The old Renold chain was a bit worn, but seemed O.K, so I put on one side the new Wipperman chain reserved for it and replaced the Renold. I was pleased to note little wear on the Potty Mod 10 lock tab, or short driving peg. It was Saturday evening and London Section Scott Club meeting. Fifteen miles towards London on the A41 the mag chain broke and the oil pump crank vaporised. Was it the crank coming adrift that took the chain or vice versa? I had enough spare links in the tool box to repair the chain, but I had no means of driving the oil pump. Unfortunately the RAC failed to recover me (but are giving me a year's free membership because of it) and fortunately my son was at home when, at midnight, I had him turn out with car and trailer.

The answer: Well, thinking back to Stage 1 and a socket, I had an old socket set with 9⁄32" square drive, the same as the oil pump reduction gear square. The largest of these little sockets just fitted the magneto nut. I ground two flats on the side of the socket so that the locking tab just gripped it, thus taking the drive off the nut and, with just one washer added to take up lateral play, we are in business. I've done about 1,000 miles since, and all is still in order. If you haven't got a suitable socket, make up a box spanner to suit. I've since learned that J.A.P. used this idea to drive Pilgrim pumps off the half-speed timing magneto sprocket on some of their engines — great minds!

It's almost impossible for my drive to come out, and the chain, even if it jumped off the sprocket, is unlikely to do any harm.

Glyn Chambers.

For members who may be disenchanted with their present system of lubrication may I suggest using a Mikuni pump.

I built a test rig for oil pumps using a variable speed electric motor as a power source, dummy oil tank and return pipes so that observations could be made. Three pumps were tested over several weeks, Pilgrim, Silk and Mikuni. Reluctantly (being a true Brit) I came to the conclusion that the Mikuni had the most to offer.

The Mikuni pump is fitted to Suzuki and Kawasaki and I would think obtainable from breakers. Mine came from a Suzuki 250cc G.T.

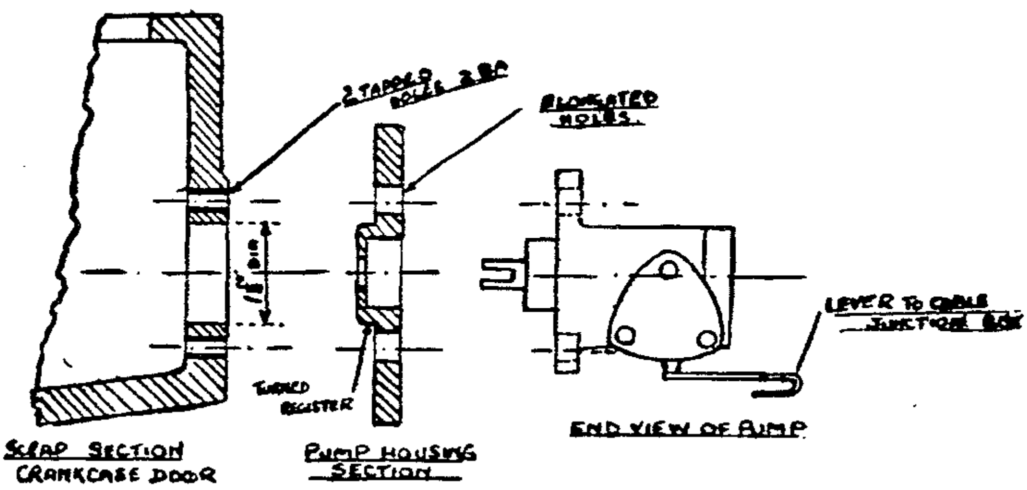
What is required is the pump, pump housing, pipe work (ie banjos) and 3 into 1 cable junction box and access to a lathe.

The housing needs a register turned on it $1\frac{1}{8}$in. dia x $\frac{1}{8}$in. to suit crankcase door. The existing holes in housing can be elongated with round Swiss file to suit 2BA holes $1\frac{9}{16}$in. CTS in door.

The drive shaft of the Mikuni has a female slot in it (3mm) and so does the Scott of course ($\frac{1}{4}$in.). I opted to change the Scott to male (sorry to bring sex into it) and made a key to suit, which was sweated into Scott drive shaft with solder it has been OK over many hundreds of miles.

Out of hexagon brass one needs to make a sort of dual threaded nut (2 off) one thread to suit existing intakes to main bearings the other to suit banjo bolts which are 6mmx1mm pitch I.S.O. coarse series, so taps of this size are necessary but are readily available. There is then just the pipe work to do, cable stop and adjusting screw since the pump is throttle controlled. I made the pipes up from nylon tubing $\frac{5}{16}$in. for inlet and $\frac{3}{16}$in. outlets.

I used Araldite to secure pipes to banjos plus brass sleeves to pinch pipes to banjo stubs, care is necessary, pumps work by virtue of the incompressibility of a fluid, air will compress, so air in the system is a no/no.



The diecast banjos (grey) are fitted to the pump, the brass banjos to main bearing intakes. It is important because there is non return valve in the brass ones. If fitted in reverse order nothing will happen.

That's about it, sounds difficult reading this through, but it is quite an easy mod really and well worth while. In traffic, smoke screens are a thing of the past. Motorists are beginning to talk to me again.

If I were looking for criticism of the mod I would say it is not aesthetically pleasing since the pipes face forward and have to be looped back on themselves in their journey to oil tank and main bearings which is a bit untidy but this is the only fault I have to find.

Syd Bartlett.

Smoke Signals

Dear Tom,

In the October issue Don Hewitt asks for other members' comments on engine oiling, with particular reference to 'Castrol Super TT 2-stroke Motorcycle Oil'.

Well, I've tried it and it seems perfectly OK, but I am now using Silkolene's fully synthetic oil in all my Scotts and I am delighted with the results. In my opinion the marginal lubrication area in the Scott engine is the piston skirt/gudgeon pin/small end-bearing area, so I am a firm believer in mixing oil with the petrol, which largely overcomes the problem, particularly if you have 'ported' pistons which eliminate the problem of a 'dead' volume of gas trapped inside the piston. (Gas flow through the piston seems to completely stop piston overheating and seizures, AND improves lubrication in the area dramatically.)

I am using Silkolene 'Pro 2' in the petrol at a ratio of about 40:1. This oil is the self-mixing type and therefore ideal for petroil mix.

In the oil tank I use the Silkolene 'Comp 2' oil which is formulated for pump-fed lubrication and therefore not self-mixing. The drippers (or Pilgrim pump) are then set to only four or five drops per minute each side, which is plenty to keep the main bearings and glands happy, with a margin for safety.

I WOULD *NOT* RECOMMEND THIS LOW FEED RATE THROUGH A PILGRIM PUMP UNLESS IT HAS EITHER A SPEED REDUCTION GEAR OR HAS BEEN CONVERTED TO NON-DRIVEN DRIPPER ACTION ONLY. (BOTH AVAILABLE FROM GERRY HOWARD.)

This dual system seems to be the ideal 'belt-and-braces' set-up, with very little smoke once the engine has warmed up, and a rather nice smell that is reminiscent of Castrol 'R' castor-based oil!

The only snag is cost, compared to good old 'Super-Two', but the mileages most of us do, it doesn't amount to anything too horrendous.

As regards Don Hewitt's comments about gearbox lubrication, it is worth mentioning that there are quite different SAE viscosity classifications between engine oils and gearbox oils, and they are not directly comparable. In other words a 140 grade gearbox oil would be like Tate and Lyle's Golden Syrup if it was on the same scale as engine oil viscosity! (In fact a 140 gearbox oil is rather like a 90 grade engine oil.)

About 25 years ago I used to test oils in a laboratory, with everything from engine oils to electrical transformer oils coming under scrutiny. I did tests of viscosity, using a Redwood Viscometer, flash-point ('open-cup' and 'closed-cup') using a Pensky-Martens apparatus, ash content, electrical conductivity (quite exciting that one, because several thousand volts were involved, and as the current arced through the oil the apparatus would trip-out and re-set with quite a bang!).

Film strength testing is very revealing, and involves rotating a ball bearing under increasing loads onto a steel plate in a pool of the oil. The synthetic oils, even then, were much better than any ordinary mineral oil, and had film strengths approaching that of vegetable (castor) oil.

At that time I was very interested in model aircraft engines, both diesel and 'gloplug' ignition, and I remember problems occurring when synthetic oils came into use. A typical model diesel engine fuel, which I would make at work in the laboratory, would consist of approximately 30% paraffin (kerosene), 30% castor oil) (YES, 30%!), and 30% ether, with up to 10% nitromethane being added as and when I could afford it.

Typical engines (diesel) were air-cooled single cylinder two-strokes with variable compression by means of a contra-piston, and varied in size from around 0.49cc up to about 3.5cc. Gloplug engines varied from around 0.25cc up to around 10cc, and both types (typically) had a cast iron (Meehanite) piston with no piston rings. I never did find out why the first synthetic-base model aircraft fuels gave problems, but it doesn't seem to relate to automotive lubrication.

These days it is difficult to grasp how awful two-stroke oils used to be, with continual plug whiskering, gummed-up piston rings, and incredibly hard thick deposits of carbon (just like coke!) blocking up ports and exhaust systems. I well remember taking the exhaust pipe off a very, very sluggish James Captain to find the effective outlet diameter reduced by carbon deposits to about half an inch!

Brian Marshall,
Aslockton, Nottingham.

Engine and Gearbox Oils

Dear Tom,

The comments in Brian Marshall's interesting letter in the December issue of *Yowl* must usefully assist in the dissemination of knowledge about one of the most critical aspects of the functioning of Scott engines. So very often these engines are well over-oiled (and to hell with smoke clouds!) as a precaution against piston damage or even seizure, whereas greater understanding of lubricant selection and lubrication methods can render such over-oiling unnecessary.

I, also, am a firm believer in the 'belt and braces' system, by adding oil to the petrol, although I tend to use a mixture nearer to 50 to 1; whatever else happens, the pistons are sure of getting some lubrication.

Castrol 'Super TT 2-stroke Motorcycle Oil' is a mineral oil containing a dispersant, and this appears to give quite low carbon deposition, due to fairly complete combustion, and a low exhaust smoke. The dispersant also enables this oil to mix readily with petrol in the fuel tank, thus obviating the necessity to use two grades of oil.

Silkolene 'Comp 2' oil is a synthetic oil; the only adverse comment that I have is that it is the opinion of several lubricant manufacturers' technical and research departments that synthetic oils can give troubles when used in older systems which are designed for lubrication by mineral oils, but I have so far not heard of any troubles arising from its use in Scott engines.

Whatever the relative merits of these and of other oils, a pump speed reduction gear, as recommended by Brian Marshal, will not only enable the safe use of low feed rates commensurate with the real requirements of the engine, but will also improve the regularity and consistency of the rate of feed and this could be a more important factor than the differences between various modern oils.

For other reasons I don't have pump speed reduction gears on my engines, and therefore I have to run the oil feeds at about ten to 12 drops per minute at a fairly fast tickover speed, and thus the dispersant qualities of the Castrol product is useful inasmuch as it overcomes some of the problems which could arise from excessive oil feed.

To all this I would add that the replacement of the old metal to metal glands by modern oil seals, thus ensuring that all the oil reaches the intended destination, is highly advantageous and so far I have not heard of nor experienced any problems arising out of the modification. The small positive pressure produced by the Pilgrim pump is sufficient to compensate for the absence of the effect of the ports in the metal to metal glands, but I have no information as to whether the small pressure from simple drip-feed to the main bearings would be sufficient. Gerry Howard may have some thoughts on this — I know that he has experimented with methods of overcoming certain drip-feed problems.

The following story may be of interest, even if not useful in the present context:

In the 1950s we in the laboratory at AMC carried out quite a lot of research and testing on engine wear and on engine and gearbox lubricants. It is interesting that the method of evaluating oils by skidding a hardened ball, as mentioned by Brian Marshall, or in some cases a roller axially, against a steel plate is not always truly indicative of oil film shear strength. I well remember an oil manufacturer — a small outfit, U.S. owned — trying to get our business. They were able to demonstrate to me that on the test rig their engine oil had what appeared to be a considerably higher film strength than that of the well known brand which we used and advocated at the time. Even quite high loading of the skidding element appeared not to rupture the oil film; no partial or full seizure nor large increase in the effort to rotate the elements were apparent at loadings well in excess of those which 'normal' oils would withstand.

We analysed the product and found that it was an ordinary mineral oil of average film shear strength, to which had been added a percentage of sulphurized oleic acid. This dissociated and formed a sulphide layer on the skidding steel surfaces, thus effectively separating them and preventing welding and tearing of the surface high spots, i.e. seizure. Unfortunately there were two disadvantages — the coefficient of friction was higher with this oil, and gums were produced at sustained engine working temperatures leading to trouble on valve stem guides and sticking piston rigns.

Things are not always what they appear to be!

Don Hewitt,
Chislehurst, Kent.

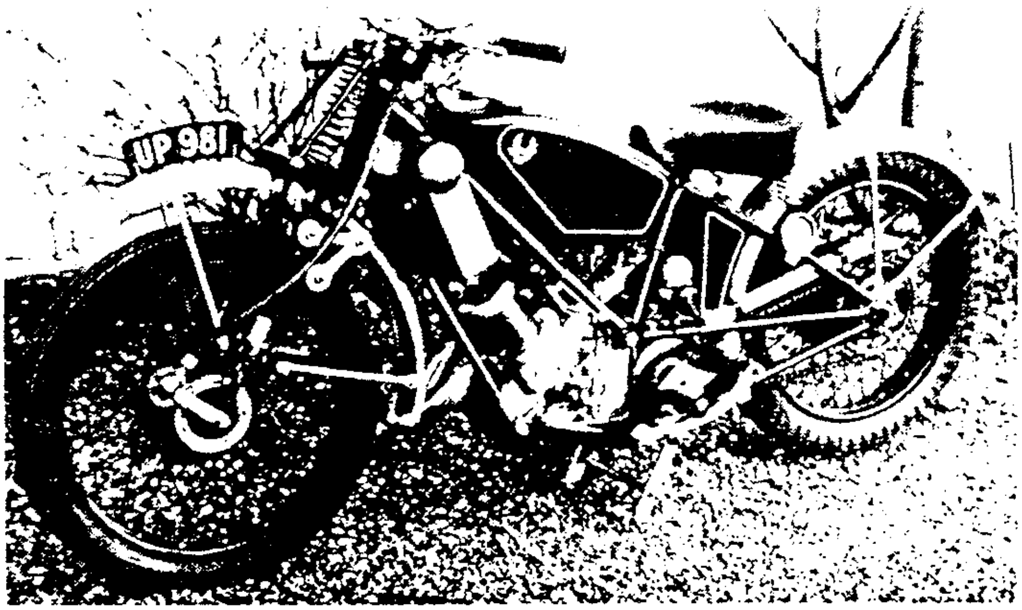
Mavro's Lubrication System

Dear Tom,

Arthur Fogg's mention of Mavro's 'unique lubrication system' in *Yowl*, Dec. '94, prompts me to send you this photograph of UO 981.

This machine, a Flying Squirrel of circa 1928 vintage came to me about 1961/62 in and advanced state of decay, and about 1963, when Mavro's article on his lubrication system was published in *Yowl*, as well on the road to appearing in its finished form as per the photograph.

Having reservations about the Pilgrim pump as originally fitted, I decided to gild the lily by making up a Mavro system based on the Best and Lloyd pump which I happened to have in my spares locker, and the result of my efforts can, I hope, be seen on the near-side crankcase door in the photograph.



What I made up was, in essence, the same as the Mavro conversion in so far as the spring-loaded plunger and the two delivery ports were concerned, but the two vertical columns separated by a stanchion providing the ball bearing 'tell tales' were made and substituted for the simpler arrangement of plastic transparent pipes with constrictions to keep the balls under control which he favoured and which was perhaps more practical than my somewhat elaborate affair.

This arrangement worked quite well, but it was occasionally temperamental with a tendency, out of the blue, to flood one side and starve the other for no apparent reason. With the benefit of hindsight I think that there were several factors that contributed to this.

1. The Best and Lloyd pump had seen better days. I eventually obtained a new cast aluminium body for this to replace the 'Mackite' original die-casting.

2. I carried out the delivery pipes from the 'tell tales' to the main bearings in copper pipe of reduced bore for which I happened to have fittings, unions etc. This was, I believe, a major error as it probably accentuated any back pressure imbalance between the two delivery pipes.

3. The configuration of the delivery pipes which was forced on me by the construction of the 'tell tales' involved inverted U-bends in both pipes in which air could well have been trapped and which could thus

have prejudiced the operation of the system. If I were to do it again I think I would mount the pump on the magneto platform (as normal with a Pilgrim pump) and ensure that the run of the delivery pipes was down hill all the way to the main bearing connections.

This was a nice machine and went well but, despite the alloy guards etc, it was, to my mind, heavy and the wide gear ratios unhelpful. I never rode it after 1978 when I reverted to the early two-speed Squirrel of my youth. I hope I may be excused for the various modifications carried out, but this was all well before the advent of the cult for originality (which I'm afraid has never held much appeal for me). I certainly have no regrets about the near-side brake lever or, indeed, the centre stand, which was carved out of pieces of rusty boiler plate after a lot of crude machining.

The machine, after its 15 years or so with me, was reconstituted in its original format and now, I believe, belongs to a Club member in Dublin. The rather elegant alloy mudguards with copper riveting adorn Kenneth Irving's excellent 486cc Squirrel, but of the whereabouts of the Best and Lloyd pump and the Mavro distribution valve I have no knowledge.

I also have a copy of the 1963 *Yowl* referred to by Arthur and could possibly help with a copy if anyone is interested. Given a good Best and Lloyd pump construction of the Mavro distribution valve presents no problem which cannot be overcome with a small lathe, a few brass offcuts, and two small reamers, $^{7}/_{32}$" and $^{3}/_{32}$".

Hope this may be of some interest.

Jack Frazer,
Ballymena, Co. Antrim.

V17/9 April 1992

THE SUPERTWO 40 STORY

After some 20+ years away I have recently rejoined the S.O.C. and have now received my first copy of *Yowl*. Many things have changed, mostly for the better, but I have been pleased to see references to 'Supertwo'. As an ex-employee of Silkolene who was very much involved with the evolution of this product. I thought members may be interested in its origins.

In the early sixties when Supertwo 40 finally came into the product range after a lengthy gestation period, Silkolene was a very different firm than it is today. Dalton & Co Ltd, (to give the company its correct title), was founded in the early part of the century by Mr Dalton Snr, who practised as a vet in Derbyshire. On his travels to outlying farms, etc, he would carry supplies of lamp oil, paraffin and tallow to sell to his clients. From this small beginning the company grew, until by the 60s it employed some 100 people. It enjoyed an excellent reputation as oil refiners and blenders of high quality oils, greases and synthetic aero engine lubricants, and it was one of the very few British manufacturers of petroleum jelly.

Virtually no advertising was done and the policy was very much: **Top class lubricants — At the right price — Attractive Packaging — Delivered on time with a friendly service** — and **Sales were excellent!**

Some 8 or 10 Technical reps/engineers/specialists sold these products throughout the UK direct to the end user. At this time we had very few retail outlets and these were mainly in the Belper area.

I was a very happy member of this team from the late 50s until 1971 when I left to join the motorcycle industry with Wilf Green and his MZ importing business.

At Daltons, no massive budgets were allowed for supporting riders or drivers as it is today. Anyone asking for such support would be courteously turned down and/or given a gallon of oil and a sticker for his vehicle. Only two people were supported by the firm, one was the Managing Director's son, our Sales Director John Dalton, who raced a Ferrari and was also a member of The Austin Healey and Aston Martin works teams. The other person was me — although the company were not aware of it, it was very unofficial (or so I thought at the time, but more of this later).

The origins of Supertwo 40 though started much earlier than this in the 1950s courtesy of a chemical company — 3 Vespa scooters — 3 Royal Enfield Princes — a Trojan Minimotor and a Villiers' powered lawn mower!

During this period a company had been set up called Anglomol Laboratory Ltd, at Hazelwood in Derbyshire, some 5 miles from the Silkolene works at Belper. This venture was a 50/50 partnership between Dalton & Co Ltd and Albright and Wilson the chemical giants from South Wales.

The firm was run as a separate entity to undertake research and development work for the oil industry with special emphasis on chemical additives. Dalton & Co Ltd were later to sell out their own shareholding as it was considered not 'right' for an oil company to be 'aware' of work being done for competitors. With this change, the company name became Lubrizol UK Ltd. Many of the improvements in lubricating oils from oil companies can be contributed to the research work done by this company through the years, but the research concerning our story was "additives to improve two-stroke lubrication."

Older riders will remember the days when straight oils were all you could get, they oiled the engine, yes — but plugs fouled or whiskered, exhaust ports gradually blocked up, piston crowns grew a thick black deposit, rings got stuck and piston skirts produced a lovely brown lacquer and all this at fairly low mileages.

In a real effort to eradicate these disadvantages, work commenced at Hazelwood to find additives to solve the various problems. Many formulations were tried, improved and/or discarded and many months were spent bench testing on stationary engines. Alongside this, thousands of road miles were done on the Vespas and Enfields, including six constant weeks at M.I.R.A. For this testing which included myself on the team, we usually used local club riders to help out at weekends as it was a wearisome job.

Different blends and mixes would be used and the bikes would be driven until they expired (usually mechanically) or the ports blocked. They would then be completely stripped/measured and rebuilt for the next test and at times this could be a nightmare.

One of the fitters involved with this was a Derby man called Norman Wallis who, like the rest of them, "did nothing but put two-strokes right all day." No wonder he rode a Thunderbird outfit!

Some of the research work concerned 'quik-mix' or self mixing oils, enabling the rider to mix the oil and petrol together very easily with very little agitation.

In fact all research was done on petroil lubricated engines of small capacity and nothing was done at all on large bore pump-fed engines (i.e. Scotts). Thoughts were not just on motorcycle engines though, two-stroke engines are used in mowers, rammers, compressors, etc, and all shared the same problems.

When research work finished and learned papers published on the subject, most of the major oil companies took up the formulations and introduced self-mixing oils to their ranges. Dalton & Co Ltd at this time introduced Supertwo 30 with all the chemical additives in it except that they were almost alone in the industry in leaving out the self-mixing agent. The company considered this as detrimental to the viscosity of the base oil and the suspended oil droplets in the fuel.

Sales were never very great of this product although the company produced it for many years. At this stage I must now reintroduce myself to this story. As a Scott rider and two-stroke enthusiast, I had been competing in trials, sprints and road racing for some time and being a good company man I always used our products throughout my machines. For engine use on the Scott I always used our Grade 48 SAE 40 castor-based racing oil, complete with all its disadvantages. So the arrival of Supertwo 30 seemed to just what was wanted. Problems though were encountered straight away, minor piston and ring seizures and big-end rollers and plates picking up on several occasions where none had been experienced before!

After much discussion and deliberation with the staff in the laboratory plus several "out of the back door" samples, we eventually arrived at a formulation that suited my engine.

Changing to a SAE40 oil with VI improvers and the Supertwo 30 two-stroke additives, further ingredients were added to combat problems in the difficult boundary lubrication areas such as uncaged rollers and the thrust side of the large pistons. Collectively, this did the trick, and the small samples became a 5 gallon drum which found use also in my Auto Union car and my son's Berkeley three wheeler.

So, readers, picture the scene a short time later, when a youthful and happy J.H. was making a rare visit to the refinery and was strolling up the beautiful entrance stairs towards the sales office, with not a care in the world! I rounded the first bend and met our elderly chairman, Mr Cecil Dalton coming down. — The conversation went something like this: "Ah, morning Hartshorne, thought you were dead?" "Oh, morning sir, no, not quite!" We passed each other by a further stair or two: "How's that Scott going?" (He had owned one before the War and was always interested in mine) "Er, very well sir, thanks." We are still walking away from each other, the gap is about ten stairs apart now: "It ought to be, you have had enough oil from the lab." "Er, er," is all I can think of to say, my brain goes numb! By this time we have both stopped, turned, and faced each other, still I cannot think of anything to say, but, he saves me! Smiling broadly he says: "Don't worry John, I understand from the lab that it works very well indeed and we have sent a sample to Commer for trials in their big two-stroke lorry engine, but really, we ought to make it legal and put it in the range, have a word with Griff and see what he thinks, morning Hartshorne." "Morning sir," says a relieved J.H. continuing upstairs (thinking "crafty old sod knew about it all the time and obviously read it up in the lab books on one of his prowls around")

Shortly after this I had a chat with our Sales Manager, Mr Williams, the aforementioned Griff, who completed the final pieces of the Supertwo 40 story in the same laconic "Dalton" way.

On the phone to the lab: "Stan, what's the next number in the Grade Reference Book? — 935? Righto 935 it is" — "John, I have had a look at the costings, I think 9/9d per gallon (trade) would leave us some profit." J.H. anxious to prove himself forever a company man. — "I reckon it will stand 10/6d Griff." — "Right 10/6d it is then." — and so Supertwo 40-935 is officially born!

Sales started straight away with owners of Scotts, Wartburgs, Auto Unions, Saabs, Evinrude, Johnson and Mercury outboards using it, with or without a pump, it suited all large bore two-strokes, including racing machines.

Production has continued up to the present day with only slight modifications to the formulation and I have used nothing else myself in all that time.

This story is not, and was never intended to be, an advertising feature for Silkolene, after all it is now over twenty years since I left them, and all my old associates in the development of Supertwo 40 have retired from the scene. It is just a story about "yesterday" and a very nice company to work for, and nice people to work with.

John Hartshorne.

V20/9 April 1998

NO SMOKING

Brian Marshall

In the October issue, in my report on the V.M.C.C.'s Founder's Day Rally, I was very critical of the excessive smoke that most of the Scotts emitted when 'paraded' around the arena.

A few days after the October issue 'hit the streets' I had a letter from Ted Jemmett endorsing my comments. He went on to say that we have now had even more bad publicity! On Monday 6th October, on BBC2, 'The Two Fat Ladies' were shown at a V.M.C.C. Lake District event, and viewers were treated to the sight of a huge smoke-screen from a Mercury-Scott and a Scott, as they departed from a village. Dennis Howard also wrote to me along similar lines, and asked for information about fully synthetic two-stroke oils.

As P.R.O. for the Club, all this sort of thing really makes me cringe, and I don't think many members fully realise just how pollution conscious, and hostile to visible exhaust smoke, the so-called General Public is becoming.

Emitting these clouds of smoke is simply not necessary, and we really must stop and think what we are doing. It is increasingly obvious that it is anti-social, dirty behaviour to more and more of the public, and I am inclined to agree with them. The last thing that motor cycling, and the Scott Owner's Club in particular, needs is bad publicity and more hostility. It can only lead to ever more aggressive legislation, and if emissions regulations are ever made so retrospective as to include machines as old as our Scotts we are FINISHED.

My personal opinion is that ALL Pilgrim pump equipped Scotts should have either one of Gerry Howard's reduction gears or one of his conversions to drip feed.

I also think that we should all be seriously considering, and therefore trying, all other possible measures to reduce exhaust smoke to the absolute minimum.

The way forwards, without a doubt, is to use a fully synthetic two-stroke oil instead of a mineral or semi-synthetic oil. As I have mentioned before, there are several on the market, notably Castrol TTS and Silkolene Pro 2 and Comp 2. They are considerably more expensive than Silkolene Super Two, but at the mileages that most of us do, it is not a major drawback.

Personally I think that a combination of Pro 2 and Comp 2 is the complete answer.

Pro 2 is a self-mixing grade and can safely be used at 40:1 in a petroil lubricated machine.

In a more typical Scott with a Pilgrim pump or drippers, I would use it in the petrol as an upper cylinder/top-end lubricant cum belt-and-braces measure at perhaps 50:1 or 60:1, and then use Comp 2 in the oil tank, at a delivery rate of **no more than half a dozen drips per minute** in each side of the engine at a fast tick-over. That is ample to keep the glands and big-ends happy.

I cannot over-emphasise that such a low delivery rate is unreliable in a Pilgrim pump unless it is in good condition **and** geared down.

This combination gives excellent lubrication and very little smoke.

Later Scotts such as post-war Shipley (1949-50), and Birmingham Scotts, have no oil tap as standard, and as a result oil tends to seep through the pump and flood the sight glasses and crankcase wells, giving huge clouds of smoke after standing just a few days. The obvious answer is to fit an oil tap, and if your memory is inclined to let you forget to turn the oil on, it is easy enough to rig up some sort of ignition cut-out or fuel cut-off, to stop you starting up without turning the oil on first.

Another problem is oil-filled silencers, especially the Burgess type, which will smoke for a week and give a totally false impression of what the engine is emitting! Not only that, they fail to properly absorb the exhaust pulses, so the machine is far too loud, AND the silencer starts to act like a straight-through plain pipe, giving an extractor effect, horrendous fuel consumption, and poor slow speed running.

Cleaning them out is not easy, and over the years I have tried paraffin, degreaser, blowlamps etc., with little real benefit. The only real answer is a new silencer, or taking a hacksaw to the silencer and repacking it with glass wool, before welding it up again. That does absolutely nothing for the cosmetic appearance of the silencer, so don't let it get full of oil!

The pre-war Howarth silencer has none of those problems, as of course it can easily be dismantled for cleaning. It is possible to convert a Burgess-type silencer so that it can be dismantled, by brazing or welding a sleeve over your hacksaw cut, with three or four self-tapping screws to then hold it all together. If polished up and then re-chromed, it could look perfectly respectable, and anything is better than being nicknamed TORREY CANYON by your neighbours!

Seriously though, unless we clean up our act now we are going to be in big trouble, and we are also going to get into a situation where the 'smokers' amongst us are going to be ostracised, cold-shouldered, tut-tutted and made *persona non grata.*

I, for one, do not want to be the person who has to say to a 'smoker' that they are not welcome at our Club events. That awful scenario could quite easily happen if we have to protect the Club's interests and the interests of vintage motor cycling in general.

We simply cannot ignore public opinion, the 'Green' lobby, or ANY adverse criticism. That Green lobby has more and more clout as the years go by.

Please convert to fully synthetic two-stroke oil and clean up YOUR Scotting now, before it is too late.

Dilution ratios for two-stroke oils

Fuel/Oil Ratio	*cc/litre*	*cc/gal.*	*fl.oz./litre*	*fl. oz./gal.*
16:1	62.5	284	2.20	10
20:1	50	227	1.76	8
25:1	40	182	1.41	6.4
30:1	33.3	152	1.17	5.3
32:1	31.3	142	1.10	5
35:1	28.6	130	1.00	4.6
40:1	25	114	0.88	4
45:1	22.2	101	0.78	3.6
50:1	20	91	0.70	3.2
55:1	18.2	83	0.69	2.9
60:1	16.7	76	0.59	2.7
70:1	14.3	65	0.50	2.3
80:1	12.5	57	0.44	2
90:1	11.1	50.5	0.40	1.8
100:1	10	45.5	0.35	1.6

V21/4 Jne. 1999

POTTY'S POLLUTING PROBLEM

Glyn Chambers

What brought the problem to a head was my faithful 'old nail' and its Pilgrim pump (see *Yowl*, Oct. 1992 and *Technicalities* 3.1.46/7). Although Potty Mod. No. 10, stage 4, was working OK after many thousands of miles, I was fed up with the Pilgrim pump drive off the magneto sprocket; in fact it was becoming "a right pain in Potty's posterior". I did not wish to put the pump on the crankcase door with reduction gear as this would have meant a new rear brake pedal arrangement and would not look right on an old Flyer.

Gerry Howard was offering Pilgrim pumps modified to drip feed (and now Ged Rumble shows you his conversion, see Aug. '98 *Yowl*), so I got Gerry to convert an almost scrap pump. This has proved to be 100% mechanically reliable, providing one remembers to turn on the tap. This system is an 'open' system in that oil drips by gravity into the pump body and via the beaks before suction gulps it into the engine. It is not a 'sealed' system as in the glass-tubed drip feeds, which are normally seen on the oval oil tanks, and which should suck in and out of the glass sight. A suitable oil for my system was difficult to find as it is impossible to find a true visco-static oil. This would not have been such a problem with a driven Pilgrim pump as oil is positively pumped to the beaks. I was looking for a drip on each beak of about one every three or four seconds, which I find about right. I do not normally supplement with oil in the fuel as on long runs I find it a pain to carry oil with me. It's messy, difficult to carry and not easy to get the proportions right with differing amounts of fuel. My oil for the last 35 years or more has been Silkolene Super II 40 in the summer and Super II 30 in the winter, both very good oils, but the 40 grade has been proving a bit on the thick side, even in the summer. Let me give you an example: after I installed Gerry's converted Pilgrim dripper and set the controls to give a good drip following a run, the following summer's morning it took over one minute for the first drip to appear and then dripped only slowly for the next half hour before settling down to something like a normal rate. At the end of a day's riding, having warmed up the oil in the tank and the feed pipe, it was dripping at more than once every half second, making a lot of smoke.

Now, I don't want that bloke Marshall and his no smoking campaign going on at me about giving the Club a bad image, but Brian is right; most members well over-oil their Scotts! Using Super II 30 all the time has eased the problem slightly, but I was determined to find a suitable oil and conducted experiments with eight different two-stroke oils.

The motor-cycle industry is well aware of the problems as modern two-strokes are often pump/injector fed through very thin pipes, so that the latest generation of two-stroke oils tend to be very thin.

I made a crude test apparatus in which the contents of a film cassette can was poured into a small funnel, the outlet of which was 1/4" bore — take note all of you with smaller bore pipes! I required 32 of these containers, as each oil was to be tested at three different temperatures. Fortunately at the time my daughter worked in a film laboratory so I had an unlimited supply. The results were quite a shock.

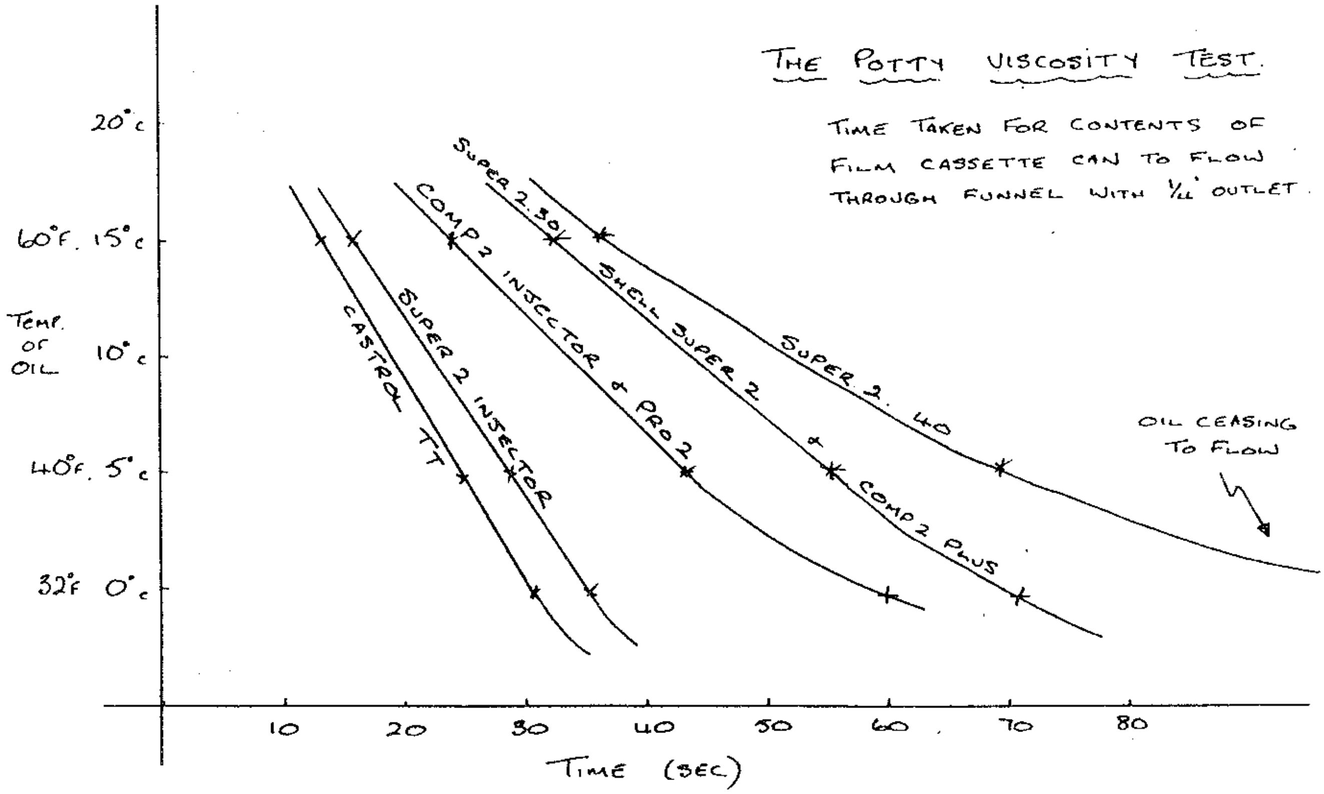
Super II 40 certainly showed itself to be thick, as at temperatures dropping below 5°C (40°F) it was ceasing to flow and at water freezing point I could not make it flow at all. The other oils were much better. The graph should explain all; not very scientific, but the results have been exactly mirrored by data given to me by Silkolene later. *See graph*

Wishing to find a visco-static oil I wrote to Silkolene's chief automotive development chemist, John Rowland, who I know from the Morgan Three-Wheeler Club and who runs and races a quick Matchless water-cooled vee-twin Super Sports.

John told me there is no such thing as a true visco-static oil of any sort and he provided me with masses of data, including the chart to which I have added the Castrol and Shell oils and approximate costs. *see chart*

Also, when talking about other manufacturers' oils, John said: "I am sorry to say that many oils submitted to me for analysis as 'synthetic' are often mineral based, with no detectable content of any synthesised base compound. Possibly a tiny amount of cheap synthetic is included to satisfy the letter of the law, or perhaps they are bottled on the same production line as used for WWII 'shadow jam' where evil concoctions of turnip, dye and sugar were passed below a strong light and a strawberry."

In a more serious vein John recommends that with modern oils, regardless of where we put the oil — in oil tank or petrol tank (and please note that you cannot use 'petroil' on a standard Scott set-up without making provision for positive oiling of the rotating glands) — we aim for a ratio of 1,900 miles per gallon, or 400 miles per litre, of oil. If you have converted main-bearing seals and are using petroil, aim for a ratio of 32:1. These figures are double for those of Scotts and other two-strokes 40 years ago. A modern tank-mix off-road bike normally uses ratios of 30:1 to 40:1 and some specialist machines using synthetic oils go to as much as 60:1.



Product	Type	Viscosity in Centistokes 100°C 212°F	40°C 104°F	15.6°C 60°F	5°C 40°F	-15°C 5°F	SAE	Vis. Index	Cost £ per Litre
Super 2 Injector	Mineral + Ester Synthet.	8.10	58	230.7	504	3390	15/20	107	4
Comp 2 Injector	Mineral + PIB Synthetic	11.17	83	328.1	707	4475	15/30	123	5
Comp 2 Plus	Ester + PIB Synthetic	12.54	83	292.5	585	4570	10/30	149	9
Pro 2	Ester Synthetic	13.50	98.6	375.7	787	4570	15/40	137	11
Super 2 30	Mineral	11.40	100.2	461	1090	8880	30	102	4
Super 2 40	Mineral	14.19	137.9	675.5	1650	14400	40	100	4
Castrol Super TT	Mineral?	—	—	200*	500*	3000*	—	—	6
Shell Super 2	Semi Synthetic?	—	100*	460*	1090*	8880*	—	—	?

* Estimated but based on Potty experiments.

The upshot of all this is that we can no longer recommend Super II 40 for most Scotts used at temperatures below 40°F (5°C) (and a summer's morning can often be this in the U.K.) and not at all when using a converted to drip-feed Pilgrim. Machines with long supply pipes are particularly vulnerable.

Our recommendation of Silkolene oil in Scotts is as follows in order of preference:

1. Comp 2 Injector. £5 a litre.
2. Super 2 Injector. £4 a litre.
3. Super 2 SAE 30. £4 a litre.
4. Super 2 SAE 40. £4 a litre. Summer only.

Exotic oils such as Pro 2 and Comp 2 Plus are not recommended and they give no advantage to a Scott, also they are hideously expensive. If you wish to add oil to the petrol then Comp 2 pre-mix or Super 2 40 are recommended. Incidentally, the PIB synthetic fluid used in the Comp 2 range means an oil that gives a very much reduced smoke output per unit of oil.

NOT GIVEN UP SMOKING YET? THEN WHY NOT TRY THIS DRIPPER PILGRIM CONVERSION!

Ged Rumble

A couple of years ago I approached Gerry Howard for a reduction drive for my pump. I was out of luck as he was in the process of having some made at the time, but he did suggest to me that the best way to lubricate a Scott was to turn the Pilgrim pump into a dripper. So, two years later, during winter 1996/1997, I decided to have a go. Jim Shelley, a Scott-owning friend of mine, had a spare pump which he kindly gave me so I could fiddle about with my idea and leave my pump intact. Here's how I went about it, and it's very simple. There must be other ideas, but I haven't seen any in *Yowl* over the last eight years.

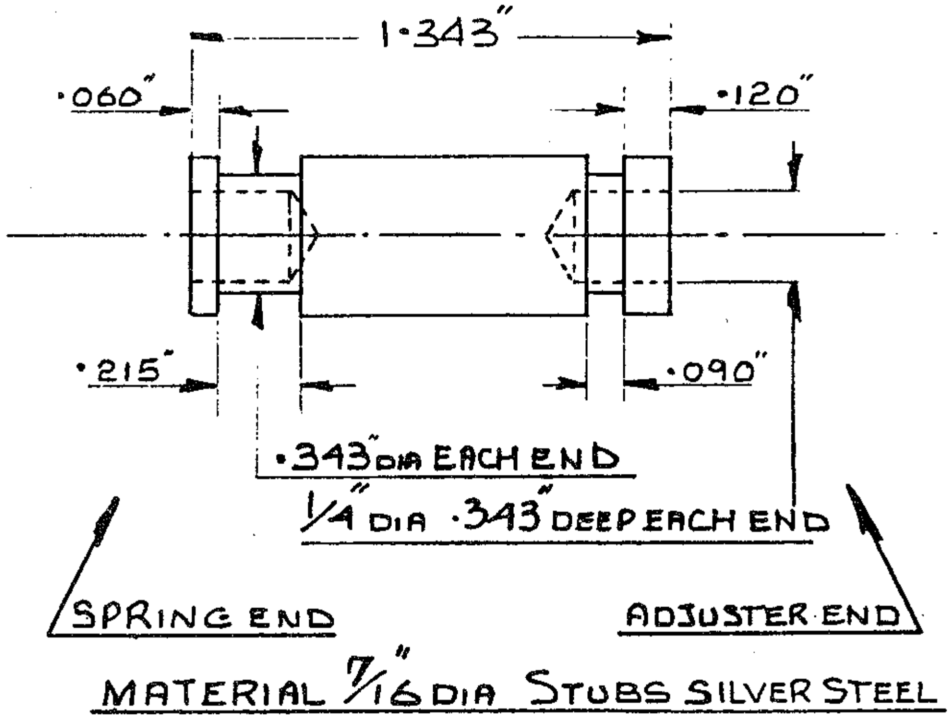
First dismantle your pump. Remove the end cam plates, DO NOT try to remove the plungers, unscrew the brass nut that holds the worm drive in place (left hand thread for offside-mounted pumps, right hand for nearside pumps), remove the worm, and then the plungers. The drip beaks can be withdrawn with a pair of flat bladed pliers, followed by the springs and balls, remove all traces of oil, and re-fit the beaks using a little thread lock to seal. Place the worm, plungers, springs in a plastic bag and store safely.

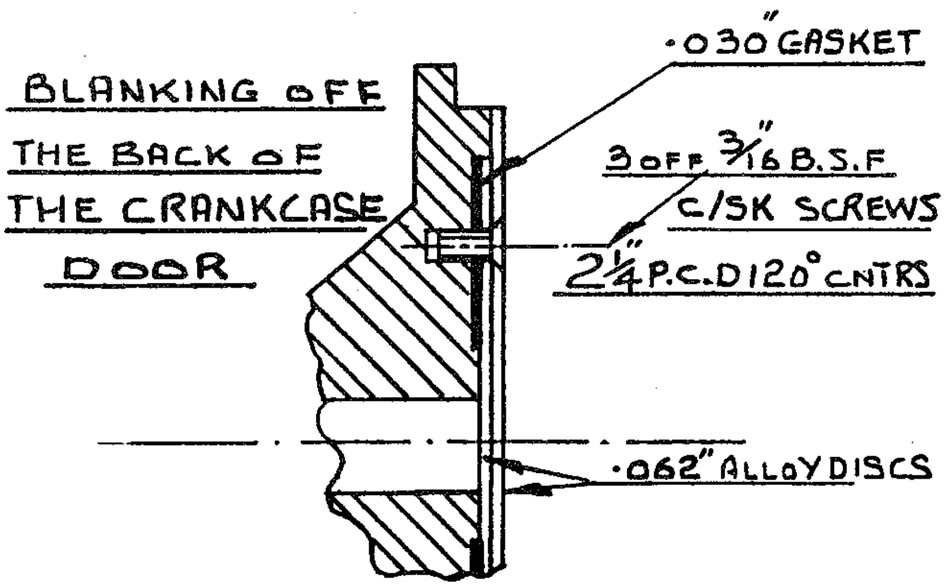
Next step is to visit your local engineers merchant and purchase a 13" length of $^{7}/_{16}$" diameter Stubs silver steel. This has a high surface finish, is ground to 0.4375" +/– 0.00025", and is ideal for the job. If you have a lathe just knock up two plungers to the sketch. If you haven't, get a friend to do it for you.

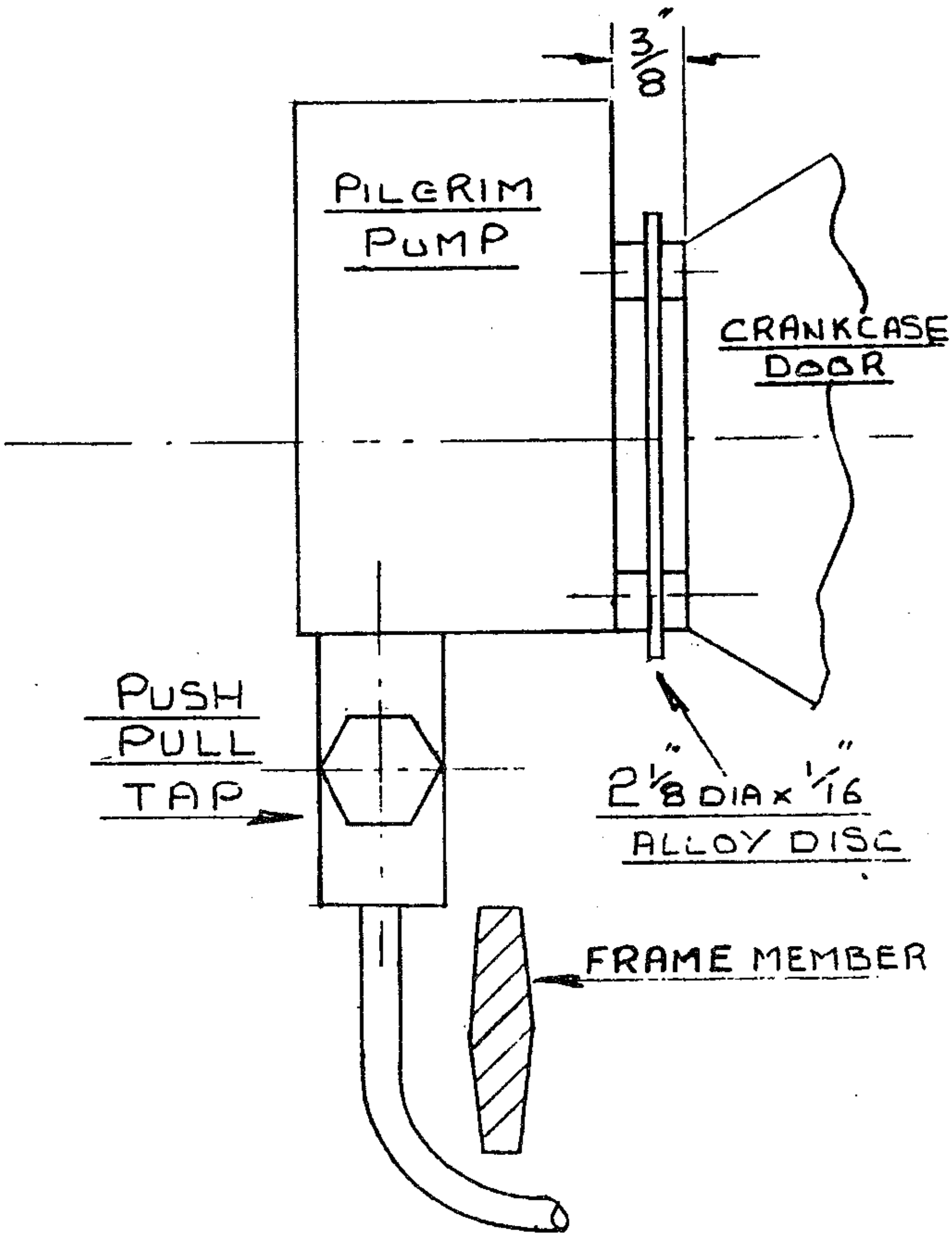
Re-assemble your pump and make sure the wide groove in the plungers is at the spring end, re-fit the brass worm nut, and Loctite a plug in its bore to prevent leaks.On crankcase-door mounted pumps, you must, of course, blank off the back of the crankcase door, and make up for the removal of the pump drive disc. This is done with a 0.030" gasket and two 0.062" alloy discs (see sketch page 454). Leave the feed tubes to the engine disconnected, turn on the oil, and take your time to set the drips to five per minute. Connect the tubes to the engine, and run on 50:1 petroil, using Silkolene Super Two 40, or better still Silkolene Pro-2 Synthetic oil through the pump and Comp-2 pre-mix in the tank at 50:1.

On my crankcase-door mounted pump, I decided to create a $^{3}/_{8}$" air gap, with a heat dissipating disc set between the engine and the pump. This worked very well, with the pump remaining quite cool even after a long run (see sketch page 455). So the drips you set with a cold pump and engine in your garage remain the same. Also, by mounting the pump out from the crankcase door, I was able to fit a $^{1}/_{4}$" BSP push-pull tap direct to the pump, outside of the frame member. This prevents flooding the pump with oil that is in the pipe from the tank even when the tank tap is off. Air from the breather holes under the Perspex gets in, and oil slowly gets out.

So there it is. My idea for a dripper Pilgrim. It works fine for me. Try it and you'll find you won't have to sit 'On Top Of Old Smokey' any more. If you're not happy with the set-up, you've still got


1·343"
·060"
·120"
·215"
·090"
·343" DIA EACH END
1/4" DIA ·343" DEEP EACH END
SPRING END
ADJUSTER END
MATERIAL 7/16" DIA STUBS SILVER STEEL


BLANKING OFF THE BACK OF THE CRANKCASE DOOR
·030" GASKET
3 OFF 3/16" B.S.F C/SK SCREWS
2 1/4" P.C.D 120° CNTRS
·062" ALLOY DISCS



your plastic bag of bits, and can go back to square one with no trouble at all.

If you have converted to modern seals and one-way ball valves on the crankcase, as I have, you may find you get intermittent oil splash back onto the Perspex cover. This is caused by a slight delay in the ball valve closing as the piston starts to descend. To overcome this, I placed a piece of very fine copper gauze over the pump deliver holes, and this has cured the problem.