3.4 Scott and Silk Pumps

THE SCOTT OIL PUMP

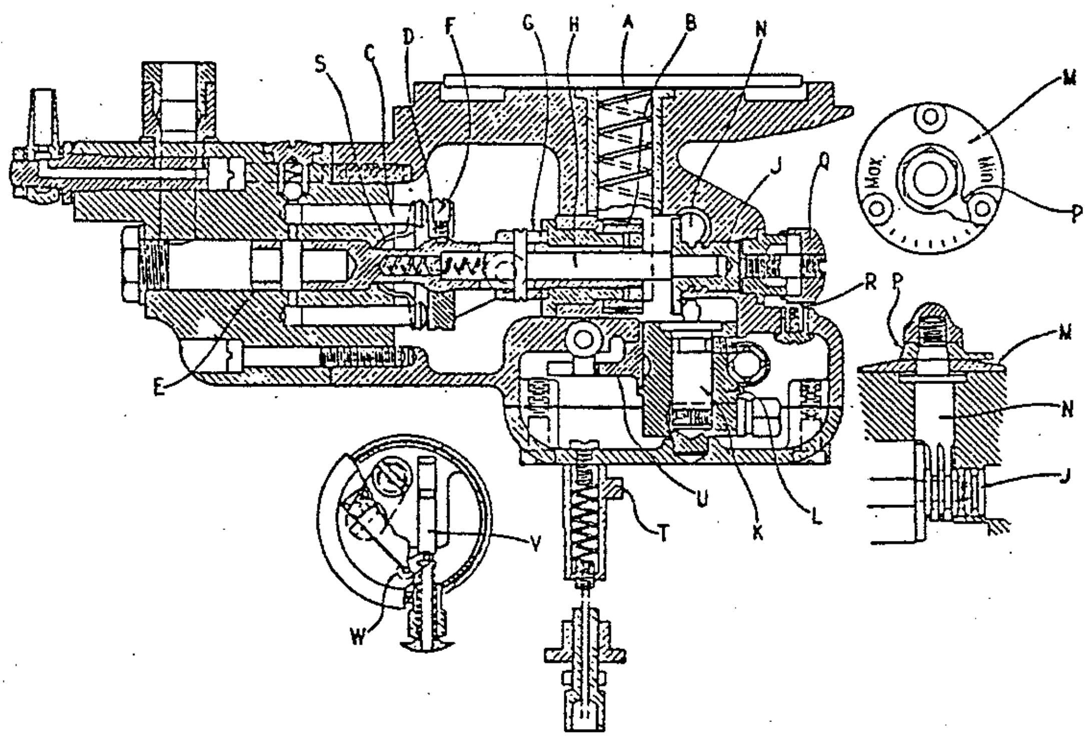
A Variable Delivery Unit Designed for Two-stroke Engines

(from *The Automobile Engineer*)

Manufactured by the Scott Motor Cycle Company, Shipley, this pump was specially designed for the lubrication of small two-stroke engines. It meters the oil, delivering it under pressure to the desired points in the engine. A drive is taken from the overhung crankpin of the engine to the drive-plate A of the pump, which is formed with a shaft extension terminating with the worm. The worm engages with worm-wheel B giving a speed reduction of 20 to 1. The pump shaft which is at right angles to the engine crankshaft has arranged around it, and parallel with it, five plungers C, each housed in a separate bore. The maximum displacement of each plunger has been arranged so that there is an ample flow of oil to meet all conditions.

Reciprocating movement is imparted to the plungers C by a variable-angle swash plate D. This swash plate revolves with and is secured to the pump shaft E by the fulcrum pin F.

The cam-block G engages with the projecting arms of the swash plate, and through the medium of a cam groove imparts the necessary tilt to the swash plate when the cam-block G is moved in an axial direction. This movement is brought about by the push rod H, the rack sleeve J, and the variable throw eccentric assembly K and L. By varying the



General arrangement of pump.

amount of axial movement of the push rod H it is possible to vary the delivery of the pump in relation to the maximum throttle opening.

An index plate M is provided, the amount of throttle opening being indicated by a rack pinion N engaging with the rack sleeve J, and having at its outer extremity a pointer P, indicating on the scale of the index plate M.

Adjustment for the minimum amount of oil corresponding to a closed throttle is provided by the knurled adjustment screw Q, a ratchet R being provided to maintain the adjustment. When the adjusting screw is turned in a right-hand direction the pump is opened, and *vice versa,* the maximum opening provided by the knurled screw Q being approximately half full-delivery.

Inlet of oil to the several cylinders is through the centre of the pump-shaft E, which is hollow, and arranged to form a rotary inlet valve. The inlet port is always full open on the suction stroke of the pump plungers. Oil outlet from the pump cylinders is through a ball valve housed in the valve blocks.

A particular feature of the pump is the positive operation of the plungers. This is provided by the wobble plate S which engages with the under-side of the plunger heads and moves in conformity with the angle of the swash plate. Thus, when one plunger is depressed the opposite plungers are lifted. This positive operation is important because it ensures the constant operation of the pump, there being no lag due to the sticking of the springs, or the possibility of the spring being unable to overcome oil drag. One plunger delivers oil to the indicator, to which it is returned to the inlet side of the pump. Indication that the pump is working is given by the displacement of a small plunger V in the indicator connected by a bell crank lever W to the small pointer.

The operation of the pump is as follows: When the engine is idling the cable inter-connected with the throttle is secured to the cable operation sleeve T. This engages with the eccentric operation lever U.

When the throttle is open the position of the sleeve is now altered due to the operation of the cable by the throttle, which in turn lifts the lever U. This lever, being part of the variable eccentric assembly, moves through the medium of the eccentric pin K, the rack sleeve J thus tilting the swash plate, which increases the stroke of the plungers and consequently the delivery of oil to the engine.

It will be observed that if the throttle be closed and the machine is running down hill with the engine turning over quickly, although the delivery of oil from the plungers is small, there are more strokes per minute. When the machine is 'all out', maximum delivery obtains because of the full stroke of the pump plungers, due to the throttle being wide open and the maximum delivery of strokes per minute, because the engine is turning over at peak revolutions.

When the machine is climbing a hill on top gear with the throttle wide open and the engine turning over slowly, there is still the maximum delivery of oil from the pump.

When idling in traffic practically no oil is required, and as there is a very small throttle opening the pump is working at its minimum. Delivery is therefore automatically adjusted to suit conditions.

(Article provided by Glyn Chambers)

The Silk Oil Pump.

The reliability of the Pilgrim Pump fitted to most Scotts is somewhat dubious, not I hasten to add because of its design, but because of the duty it is asked to perform. The problem is that for the very small quantity of oil the pump has to operate on the very tip of the cam, which consequently wears very rapidly.

The Best & Lloyd pump which was fitted to some earlier Scotts, still has the problem of not being designed for very low oil flows but, since the flow is controlled hydraulically, the mechanical action of the pump is not affected.

The Silk Engineering Scott has always been fitted with a Best & Lloyd pump and has never had any oiling trouble. When we started supplying the Silk Crankshafts there were enquiries about the best type of oil pump, and since the Best & Lloyd is no longer available, and we could not recommend the Pilgrim, we had to design a pump. The first of these pumps was seen at the Rally last September on John Hobley's machine. The design is based on the B. & L. principle and for the uninitiated we give the following description:-

It is a piston pump in which the piston and cylinder rotate together through a 35 to 1 reduction worm and wheel, from the engine in the same manner as the Pilgrim. The axial motion of the piston is obtained from a stationary ring which has a cam profile cut on its inside diameter. A pin on the piston engages with the cam. The cylinder is provided with a single port for oil flow which for half a revolution is open to the oil inlet and for the other is open for the oil outlet. The piston motion is timed such that it is moving up while the inlet is connected to the cylinder and down when the outlet is open. This condition, unfortunately gives considerably more flow than is necessary for the Scott. To enable the flow to be reduced the piston drive cam is made adjustable. This makes it possible to time the cylinder port relative to the piston movement such that the flow in either direction is caused. It can be seen that if for half the piston stroke in each direction the inlet (or outlet) is open the quantity of oil drawn in will also be pumped out, and hence the net flow will be zero. This means that it is possible to set the pump to give a net flow of any desired amount between zero and maximum, and that under all flow conditions the mechanical action remains unaltered.

The Silk pump uses this principle but incorporates modern techniques for reducing wear and has the inlet and outlet connections positioned to suit mounting on the right hand crankcase door of the Scott engine. It is in fact a direct replacement for the Pilgrim unit. The tell tale, which was a feature of the Best & Lloyd pump has been deleted since all it does is provide another joint to leak — for those who like to watch the oil going into the engine — transparent feed pipes are supplied. Also included is a connection for an oil feed to the carburettor if this is required.

If your appetite has been whetted — further details can be obtained from Silk Engineering, 61 Netherfield Road, Sandiacre, Notts.

Engine and Gearbox Lubrication

Dear Tom,

I am sorry to be so late in responding to Mike Keighley's letter in the April '94 issue of *Yowl*, relating to Scott crankshaft oil seals. I had in fact reported at some length on my findings after 1,500 miles of running, in the April '93 issue. Briefly, they were:

— no discernible signs of wear on seals, shaft sleeves, or thrust washers,

— no oil leaks into cavity between crankcase chambers,

— David Brierley found no change in end-float measurement on his bike, but the flywheel had gone a bit rusty!

Also, I mentioned that I am finding 'Castrol Super TT 2-stroke Motorcycle Oil' performs very well, partly due to its dispersant additives, yielding lower carbon deposits, and that it seems to be possible to reduce somewhat the amount of oil being fed to the engine via the Pilgrim pump, with resultant cleaner exhaust. If other members have tried this lubricant, then their findings would, I am sure, be of considerable interest.

My mind has been exercised recently by the matter of oil leakage from Scott gearboxes — both ends — which have no real oil seals. I had a chat with the technical people at Castrol, Swindon, about this problem and their records, which go back to 1927, show that the oil recommended for the Scott gearbox was — and still is — Castrol 'D', s.a.e. viscosity 140, which is a straight gear oil and which our older members will remember from the 1930s.

Although Castrol claim still to produce this oil, they could not trace having supplied any to any distributor or stockist in the south of the country during the past couple of years. Oil of this viscosity will reduce leakage considerably in comparison with lighter oils such as engine oils, and in my opinion is safer than a thixotropic material, which may not adequately lubricate the bronze bushes during the first mile or two of running.

I talked also with the technical people at Shell, B.P., and Duckhams. The only s.a.e. 140 viscosity oils readily available in small quantities, are generally the E.P. types and the consensus of opinion is that the E.P. additives can cause trouble by reacting chemically with the surface of the bronze bushes in pre-war gearboxes. The Castrol people think that their latest type of additives probably do not have this problem, but since our gearboxes certainly do not suffer E.P. conditions, I prefer to use a straight gear oil anyway.

I eventually discovered that Morris Lubricants of Shrewsbury (0743 232200) produce a straight gear oil of s.a.e. 140 viscosity, and supply it through area distributors. It costs £9.40 per five litre can, is designated 'A.G.140' and it has a beautifully sticky consistency!

The local distributor supplied me — same day — with a five litre can of AG140 and I cleaned out the gearboxes of my 1930 Sprint Special and that of a bike fitted with a post-war gearbox with sleeve pinion oil seal, and filled them to the level plugs with this oil. So far, they have remained leak-free.

Of course, it is possible that other of the small oil-blender firms produce a 140 viscosity straight gear oil and can supply it in small quantities, but I was unable to locate such suppliers. Certainly the large oil companies market industrial straight gear oils of this and even higher viscosities, but they supply these oils in 40 gallon barrels.

It would be nice to have opinions and experiences from other Club members about this annoying Scott gearbox problem. It is so embarrassing to park a bike in a friend's driveway, and leave a puddle of oil!

Don Hewitt,
Chislehurst, Kent.