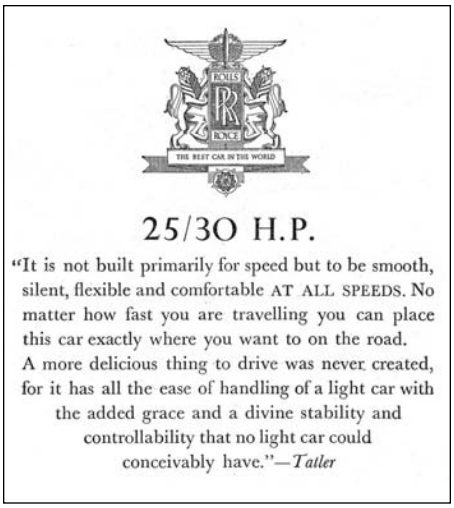
Small Horsepower Seminar

By Gil Fuqua (TN), V.P. Tech-Prewar

Aficionados of small horsepower cars traveled to Mechanicsburg for a hands-on seminar focused on dismantling and evaluating a 20/25 engine for rebuilding. Our instructor, Tim Jayne, is the new proprietor of Dennison Motors, having worked closely with founder John Dennison for over 14 years in the business.

The classroom engine was removed from the author's car the week before the seminar and served as the guinea pig. The engine ran fine and had very good compression in all cylinders, but it overheated intermittently. A full diagnosis was in order to determine the source of overheating and evaluate what else might be amiss. Bob and Reg Thompson also brought another 20/25 engine, hauled all the way from Canada, to serve as their personal classroom subject.

As part of the seminar, Tim had prepared an extensive handout for members that included Lee Haacker's excellent articles in *The Flying Lady* on rebuilding a 20hp and a 25/30 engine ("20hp Rebuild" in *FL*75-1, 75-2, 75-3, 75-4; "25/30 Rebuild" in *FL*72-5, 72-6, 73-1). A valuable checklist for engine rebuilding compiled by Will Fiennes on behalf of the Rolls-Royce and Bentley Specialists Association, of which Dennison Motors is a member, was also included. Rolls-Royce service instruction leaflets detailing connecting rod big-end bearings, main bearings, cylinder liners, pistons and rings, slipper flywheel (crankshaft vibration damper), clutches and engine timing information were also included as part of the information that each participant received.



Tim Jayne started the seminar with a general discussion of small horsepower cars, maintenance considerations, and sources for parts required in an engine rebuild. He recommended the addition of a modern oil filter, such as the kits supplied by Fiennes[1] and Ristes[2] in the UK. The oil filter kits include a replacement oil line that replaces the original that goes from the oil pump to the side of the engine block and incorporates an adaptor for a modern spin-on oil filter. The oil filter kits require no permanent modification of the car, and the process is completely reversible by simply replacing the original oil line.

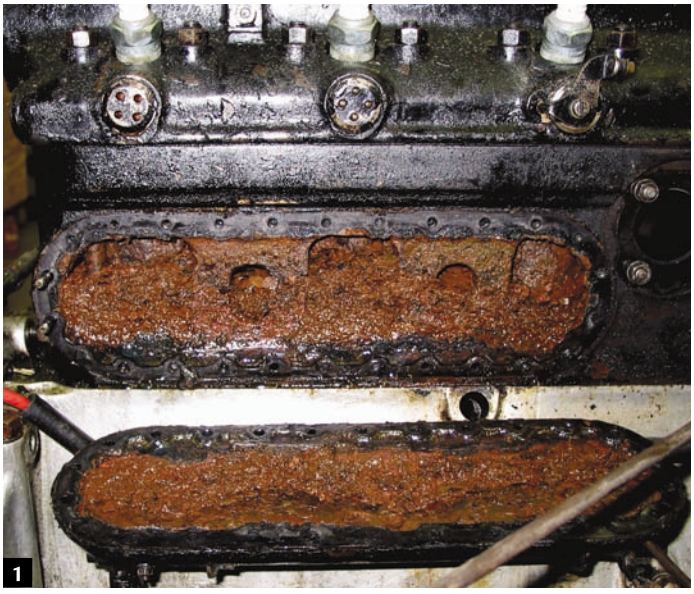
The addition of the modern oil filter provides enhanced protection for an expensive engine and the soft babbitt bearings used on the mains and connecting rods. A modern filter is clearly better than the original oil "filter" that is contained in the sump. The original oil filter is little more than a wire mesh screen that might catch loose nuts and bolts clanking around the sump. Tim also suggested that owners change their oil every 3,000 miles or at least once a year regardless of mileage.

In addition to fitting an oil filter, Tim recommended the installation of an inline water filter, such as the gano filter or water filter sock sold by the RROC. It was noted that even a newly rebuilt engine can benefit from an inline water filter to capture silt that builds up as a result of the chemical reaction of water circulating around different metals in the engine. The water filter protects the radiator, water pump, block and head; all vital and expensive components.

What warrants an engine teardown? There are many clues that might indicate an engine has worn past the point of continued reliable service. Tim suggested a number of symptoms that might hint that a rebuild was in order, including excessive oil consumption (Haynes[3] suggests oil consumption of 1 pint per 150 miles as acceptable), smoking exhaust, overheating, disturbing engine noises and knocks that are not characteristic of a fine RR engine, and low or erratic oil pressure. Some potential engine problems can be diagnosed with a compression test and leak down test (more in a later article). Other potential problems can only be investigated by an engine teardown.

This article will not attempt to iterate the complete dismantling procedure since this is covered well in the Haacker articles and in Haynes book. Instead, this article will highlight key points Tim made during the seminar that might assist owners in rebuilding their own engines.

Before starting the disassembly process, be sure you have a container to collect the nuts and bolts as they are removed. Tim uses Ziploc bags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The rear side plate on the block was removed and revealed rust and silt build-up that significantly occluded water circulation and cooling in the block.


2

Tim Jayne uses a long screwdriver with tip ground to exactly fit the 2BA screws that hold on the side plates on the block.

Copper tubes in the head are removed with a special stepped punch. It is recommended to remove the tubes in the head and block to facilitate more thorough cleaning of silt and rust to improve water circulation after an engine rebuild.

to hold each group of nuts and bolts. Mark the bag with a permanent marker to indicate what's in each bag. Resist throwing all the nuts and bolts into a single pile; it will take you hours to sort them out afterwards. Bag and label each part as it is removed.

Use a camera to document each step of the disassembly process. The photos will help sort out the parts later in the rebuild process. The author recommends a digital camera because of the ability to preview the picture on the camera's LCD screen and the low cost of taking multiple photos compared with a film camera.

The cooling system should be cleaned out to maximize engine performance and engine life. Side plates on the block should be removed to clean out accumulated silt and rust [1], [2]. The copper tubes running through the block and head should be removed to gain increased access for cleaning [3]. New copper tubes with annealed ends should be installed and swaged into place after the block and head are thoroughly cleaned. Tim recommended having the block, head and radiator ultrasonically cleaned.

Tim uses a commercial company[4] to ultrasonically clean radiators, heads and blocks. The company's industrial-sized ultrasonic cleaning tank uses heated sodium hydroxide combined with high amplitude sound waves to vibrate the fluid and clean the parts. Most radiator shops do not have this type of system due to the high cost and the heavy metal sludge that settles out and is considered as hazardous waste by the EPA. The block and head should be pressure tested before reinstalling. You may find that stop leak is the only thing holding them together.

Consider having the aluminum castings for the crankcase and engine pan vacuum impregnated to seal from oil weepage since the original castings are usually porous. Alternatively, you can use glyptol, a paint-like product made by GE, to seal the inside of the oil sump. Do not use any type of sealer unless the aluminum castings have been thoroughly cleaned and degreased since you don't want them coming loose and circulating with the engine oil. Note that the idler gear has a left-hand thread.

The carburetor side of the engine has a number of rods and linkages. These should be removed as a group, when possible, to maintain the correct position and orientation of the rods. This will significantly aid in the reinstallation process.

In removing the rocker arm, loosen all nuts and remove them evenly. This minimizes stress and distortion of the rocker arm since some arms are under pressure (valve spring) and some are not [4]. Tappet rods are numbered and their positions should be noted on removal. Put them back in their numbered order when rebuilding the engine. Before removing the front timing cover, be sure and remove the two dynamo brakes (top and bottom of timing cover case) [5]. Remove the nuts securing the head by starting at the center and working out to the edges; loosening each nut a quarter turn at a time. This is time consuming but will minimize head distortion. Be careful since a new head costs over $5,000.

Clean out the petrol tank, Autovac, and inline petrol filters. Don't feed a newly rebuilt engine with dirty petrol. Change the antifreeze/water mixture every two years. The change is important to renew the protective additives in

Shop-made tool to compress valve springs. The end is threaded 5/16" BSF and screws on to the rocker arm bolts. The handle has a sliding arm to center the tool over each valve spring. This design allows you to remove the two valve springs closest to each rocker arm bolt.

Before removing the front timing cover, remove the upper and lower dynamo brakes that are held in place by two nuts. The "bearing" surface of the dynamo brakes is made of lignum vitae, a very hard, dense wood that is often used for propeller shaft bearings in boats.

Peter Sedmihradsky (ONT) and Phil Birkeland (WA) work on removing the numerous cotter pins securing the castellated nuts on bearing caps.

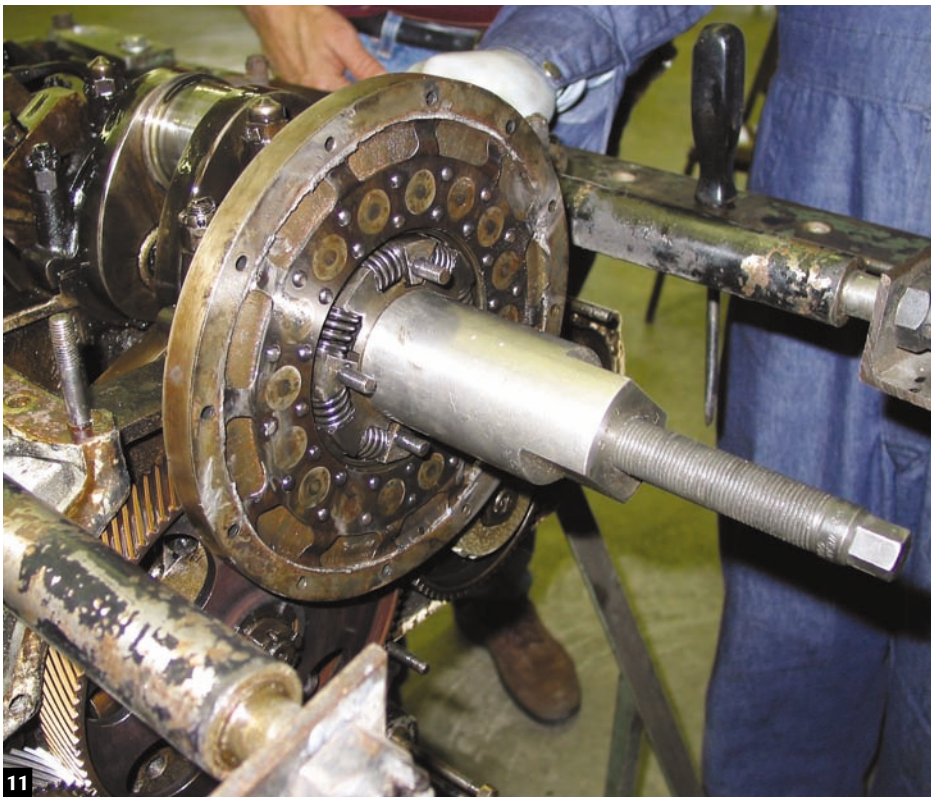
The crankshaft has hollow journals that fill with oily sludge as a result of the centrifugal-like action of the spinning crankshaft. Aluminum plugs seal the ends of the journals and are held in place by through-bolts. The plugs should be removed and the sludge cleaned out so that oil flows freely to the big ends of the connecting rods. Note build-up of sludge in journal.

Aluminum sludge trap seals showing build-up of oil sludge and plug of sludge (middle) removed from journal.

The connecting rod has an external oil line that is soldered at the top and bottom of the rod. The solder joints are subject to coming loose and should be pressure tested to insure they do not leak. You can fish a piece of piano wire down each oil line to insure it is clear. The integrity of the oil line is important since it is the sole source of lubrication to the small end of the connecting rods.

Robert Reynolds (MI), Tim Jayne (PA) and Peter Egeli (MD) inspect a piston for carbon build-up, scuffing, and piston ring integrity after removal from the block.

antifreeze. After removing the radiator from the car, plug the bottom drain and fill the radiator with an antifreeze/water mixture. This prevents corrosion build-up and the old solder from drying out and possibly resulting in pin-hole leaks. Tim uses a torque wrench to remove each nut on main and connecting rods [6]. The torque values required to loosen each nut are recorded,



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Removal of the slipper flywheel requires a left-hand threaded puller.

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Snap-On makes a generic flywheel tool (A144) that fits the small horsepower flywheel. It can be used to turn the flywheel or hold it in place to remove the flywheel bolts.

13

The flywheel bolts are peened over or center-punched to secure them. You have to grind off the bolt edges to remove the nuts. Be sure and use new bolts on the rebuild.

14

Shop-made tool to remove the pin in the cam roller bearing. The hex stock was bored out to accept the cam roller bearing and slotted to hold the wheel in place. A cross-drilled hole allows a punch to be centered on the wheel for removal of the pin.

15

Cam roller bearings should be removed and closely inspected for pitting of the cam wheel and play in the wheel. The pin and/or wheel should be renewed if worn to assure a smooth running engine.

noting the cam side and off side torque values. Comparison of the torque values might highlight potential bearing problems and can be used to reinstall the existing bearings if they do not require new babbitt and line boring [7], [8].

The connecting rods on early cars have an external oil pipe that should face the center of the engine when they are reinstalled [9], [10]. In dismantling the slipper flywheel, look for alignment marks on facing surfaces (usually an "o"). If no such marks can be found, use a punch to mark facing surfaces to assist in reassembly. The puller for the slipper flywheel is left-hand threaded [11]. The bolts attaching the flywheel are peened over the nut or are center-punched to secure them in place [12]. You have to grind off the peened-over portion of the bolt flush with the nut before they can be removed. This destroys the bolt, and new ones should be used on reassembly [13]. Tim reassembles the flywheel nuts with Loctite rather than peening over the bolt to secure them in place. The cam is held in place by steel dowels that require a puller to extract them from the block [14]. With the pins removed, the camshaft and cam bearings can be removed intact from the front of the engine [15].

In removing the main bearing caps on the crankshaft, be sure you keep the orientation of the caps the same as removed (do not reverse). After the crankshaft is lifted from the engine, reinstall bearing caps in the same orientation as removed. ℞

1 Fiennes Engineering, Clanfield Mill, Little Clanfield, Oxfordshire OX18 2RX, ph 01367 810438, email: enquiries@fiennes.co.uk, Web: www.fiennes.co.uk

2 Ristes Motor Company Limited, Gamble St, Nottingham NG7 4EY, ph 0115 9785834, email: info@ristes.zee_web.co.uk

3 *Rolls-Royce Small Horsepower Engines (The overhaul of Rolls-Royce 20 h.p., 20/25 h.p., 25/40 h.p., Bentley 3½ litre and 4¼ litre engines.)*, R. Haynes and M.A. Grigsby, published by Rolls-Royce Enthusiasts Club, 1977

4 Antonini Radiator, Inc., 325 East Railroad St., Pottsville, PA 17901, ph 570-622-3044