NEWSLETTER

RETIRED CHARTERED ENGINEERS ASSOCIATION
WORTHING

Hon. Secretary: S. Oliver Elphin, North Drive, Angmering, BN16 4JJ ☎ 01903 787116

FORTHCOMING EVENTS

19th to 23rd May		**Spring Break** to Monschau, Germany
16th to 19th June		Mature drivers' seminars see pages 9 & 15 for details and signing up
18th June	Wednesday	**Outing** to Filching Manor Museum and Michelham Priory see pages 10 & 13 for details and signing up
16th July	Wednesday	**Outing** to HMS Warrior, Gosport Sub-base see pages 11 &13 for details and signing up
20th August	Wednesday	**Outing** to Tenterden Light Railway see pages 12 & 13 for details and signing up

Coffee Mornings

Laing's Arcade Cafe, Montague Street, Worthing.	Every Monday
Albion Inn, 110 Church Road, Hove.	First Wednesday of the month 2 Apr, 7 May, 4 Jun, 2 Jul, 6 Aug
Three Crowns, East Preston	Third Thursday of the month 17 Apr, 15 May, 19 Jun, 17 Jul, 21 Aug
Beach Hotel, Worthing (with Ladies)	Last Thursday of the month 27 Mar, 24 Apr, 29 May, 26 Jun, 31 Jul, 28 Aug

Coffee mornings commence at 10.30 a.m., except at The Beach, which is from 10.45 a.m.

Copy date for next Newsletter 11 Aug

Membership

We welcome the following new members:

Changes of address/telephone:
G.R. Martin, 18 Burley Road, Felpham, Bognor Regis, PO22 7NF. Tel: 01243 587492
S.R. Renew, 2 Farm Way, Rustington, Littlehampton, BN16 2PR. Tel: 01903 785891
K.H. Lambert, Tel: 01903 859188
To date we have 108 members.
Mrs B. Phillips wife of T.W. Phillips, member 1985/89 (deceased), died on 18th January, 1997 after a stroke.

Cathodic Protection - Talk by R.G. Bailey, member, at the Durrington Community Centre, 8th January, 1997.

What is CP.

Cathodic Protection is Corrosion where, due to electrolytic action, the anode corrodes and the cathode does not. By selecting a metal to corrode in preference to another metal cathodic protection is achieved. Humphry Davy used it to protect naval vessels in 1824. This is called "sacrificial anode cathodic protection". A much more effective way is to apply a small DC. voltage to a conducting metal (an anode) immersed in the electrolyte (sea water) and to connect the negative of the power supply to the metal to be protected (the cathode). The protected metal can be steel pilings for a jetty or intake channel, pipelines or water boxes containing sea water, etc.

The voltage needed is 3 to 6 volts depending on volt drop in the wiring. To achieve protection it is necessary to depress the voltage of the cathode surface by about 300 millivolts. This is measured by reference to a standard reference half cell. In sea water a zinc electrode is most suitable.

Malacca Power Station 1961/63.

The writer took over as Electrical Engineer here in 1961. Severe corrosion of sea water cooled turbine heat exchangers (condensers particularly) caused such rapid attack that the availability of the plant was in jeopardy at a time when system load was equalling installed capacity.

There was an existing CP system at this power station which protected the marine works (jetty, intake flume and sub-sea oil pipeline).

Up until the 1950`s the main problem with CP applications was short anode life. At Malacca the original carbon rod anodes buried in the beach had failed and the system was running on a steel buoy which was wasting rapidly on the sea bed (it in fact lasted for about 18 months).

Around 1959 it had been discovered that a titanium rod when tipped with platinum acted as an insulating conductor when placed in sea water. The current flowed via the platinum with very slow loss of metal such that an anode life of about 10 years was in prospect. The fact that the titanium acted as an insulator and conductor at the same time was due to the formation of a brown film of titanium dioxide when the metal was made anodic by the application of a low DC voltage (a voltage greater than 9.0 V. resulted in the loss of the insulating film and rapid corrosion of the titanium. This is in fact and example of " Anodic Protection").

Preece Cardew and Rider (Consulting Engineer to The NEB Malaysia) had ordered a consignment of Platinised Titanium rod anodes from MAPEL together with a transformer rectifier unit for installation on the sea water pump manifold. It arrived shortly after the writer who, with no previous experience in this field, was responsible for its installation and commissioning. It is thought that this was the first application of platinised titanium rod anodes commercially.

Installation was straightforward and simply required drilling and tapping 1 inch BSP holes and screwing in the anodes and zinc reference electrodes. On putting into service anode rod failure due to vibrational fatigue was experienced within a few days. Using the station workshop the anodes were redesigned with tufnol in place of plastic mounts and the system put back into service. The monitoring of the effectiveness of the protection proved difficult due to the requirement that protective potentials were to be read adjacent to each electrode. The writer then experimented with running back all reference electrode connections to a common rotary switch and with individual shunts to monitor anode currents it became easy to set up and monitor the whole system.

Following the success of this the writer then specified a new system to cover the steam turbine condenser water boxes and all other sea water heat exchangers in the power station. The equipment was procured by PC&R from MAPEL and the features incorporated:

(a) Reference electrodes wired back individually to a rotary selector switch.

(b) Reference potential voltmeter to be centre zero scaled.

(c) Anode circuits to be individual and separately monitored via rotary selector switches and shunts,

establishing the standard for all future cathodic protection equipment supplied throughout the world.

The writer then went on to produce a standard Crown Agents Specification for procurement of Cathodic Protection Equipment which was used on all subsequent N.E.B

Malaysia power stations. A contribution was also made to the Draft British Standard Code of Practice in 1969 but many of the recommendations put forward were not incorporated in the final document. This means that using the British Standard Code of Practice for Cathodic Protection usually results in overdesign.

Dubal Desal Plant 1978/90.

The writer became Manager of the Power Station and Desalination Plant whilst construction was in progress and it was immediately apparent that corrosion was taking place in the massive sea water manifold before the the first evaporator had started.

An order for Cathodic Protection equipment, based on the BS Code of Practice, to cover all sea water systems was placed. This was deliberate on the part of the writer since he knew that overdesign would mean considerable surplus equipment to cover brine systems and other plant items viewed at that time as being covered by protective coatings.

As plant commissioning progressed it was seen that the brine inlet manifolds were corroding so rapidly that the contractor (Weir Westgarth) would be on sight forever trying to fulfil the 12 months performance warranty.

There did not seem to be any previous records of successful cathodic protection of high temperature brine vessels and so the writer embarked on an experimental installation on one evaporator in 1982. The first anodes failed due to vibration and rapid loss of platinum but working with Hockway Ltd through several design changes a high temperature anode was developed which is 16 mm diameter with internal projection of 130 mm and a platinum coating on entire length of 75 microns. This gives a life of about 2 years (other sea water anodes have a 25 micron platinum tip and a life of about 10 years).

By the middle of 1984 the whole of the Desalination Plant was covered by Cathodic Protection and the objective set by the writer in 1981 had been achieved viz :-

"The evaporators should operate continuously without corrosion and with shutdowns limited to a few days at convenient times to permit acid cleans, internal inspections and unavoidable rotating plant and valve maintenance."

It has been estimated that the savings in maintenance costs compared to other Desalination plants in the Middle East are of the order of one million pounds sterling per annum. Even more important is the reliability of this plant which supplies half the water needed by Dubai.

Conclusion.

The writer went on to describe interesting phenomena observed during the operation of the DUBAL installation particularly the dramatic effect of slug dosing of chlorine which had no effect on the sea water system but was very severe on the brine system.

For the future it was envisaged that the construction of an evaporator made entirely of cheap steel using Cathodic Protection would more than halve the cost of an evaporator (he has written a paper on this). A scheme the writer is particularly keen on would be construction of the Severn Barrage using cheap steel with Cathodic Protection at a fraction of the cost of contemporary Civil Engineering methods.

Reg Bailey

SE for Supreme Effort - rebuilding a class 5 locomotive

Talk by G.H. Picken, member at the Durrington Community Centre, 12th February, 1997.

This talk is not about a subject I covered professionally but is about a hobby. I did have professional connections with railways but these were concerned with electric traction power supplies, earthing and stray currents. Clean modern electricity not dirty old steam engines! It is about one particular "modern" steam engine, the BR Standard Class 5 mixed traffic locomotive, one of the last to be built in the UK for service with the British Railways.

On the 1st January 1948 the LMSR, LNER, GWR, SR companies and London Transport were nationalised and placed under the Transport Commission, the Chairman being Sir Cyril (later Lord) Hurcomb. The commission was managed by 5 executives, the Railway Executive being responsible for taking over the railways. It had 7 full time members with Sir Eustace Missenden as Chairman and R.A.Riddles (formerly Vice-President LMS) as the member responsible for rolling stock. Sir Eustace Missenden was General Manager of the Southern Railway Company at the time of the Battle of Britain and the Battle of Britain class locomotive No.34090 was named "Sir Eustace Missenden - Southern Railway" to acknowledge the efforts of all the staff of the railway during the battle. Riddles recruited his key staff, mainly, from engineers he had worked with in the LNWR/LMS. Their initial concern was standardisation on the most efficient and economical motive power obtainable but no revolutionary developments were to be attempted Nationalisation provided an opportunity to select the best components from the 4 companies and to persuade the former staffs to accept the selected component. This had been attempted previously under the Association of Locomotive Engineers which was intended to exchange ideas and agree common standards in design. However the only standard to reach any degree of agreement was on tyre profiles but even on this the GWR did not agree as they wanted a deeper flange. The association was disbanded by Riddles. The policy was to standardise on steam traction until such time as electric traction could be introduced so as to avoid an intermediate stage of diesel traction at least for main line services not already electrified. There was a cost advantage in steam at 1950 prices as shown below:

Type	Capital Cost £	Starting TE lb	Cost/lb TE £	1hr DBHP	Cost/DBHP £
BR Class 5 4-6-0	16,000	26,120	0.61	1,200	13.3
Diesel Elec. 1600hp	78,200	41,400	1.89	1,200	65.0
Gas Turb. 2500hp	138,700	33,000	4.20	2,000	69.4
DC Elec. 1500V	37,400	45,000	0.83	2,120	17.6

Interchange trials were carried out in 1948 which showed that no one existing locomotive in each class of locomotive was sufficiently superior to justify selection as the standard. The trials also showed that locomotives designed for use in a specific geographical area could perform well outside this area.However loading gauge (GWR) and axle loading (LNER) restrictions prevented some locomotives operating in some areas. This and other factors with regard to interchange of fittings and resistance to change gave rise to the decision to design a new range of locomotives which would incorporate the following factors: Best modern practice, Simple to drive, Easy to maintain, Able to run on indifferent coal, Two outside cylinders, if sufficient, Outside valve gear for easy access, Standard fittings throughout the range, A wide firebox where possible.

The middle of the range is the class 5 mixed traffic 4-6-0 locomotive which incorporated the 3B boiler from the LMS class 5 with modifications to incorporate the BR standard fittings.It is not possible to use a wide firebox with the 4-6-0 wheel arrangement and the diameter of wheels used.A reasonably large grate area is obtained(28.65 sq.ft.compared with 40.2 sq.ft.for the 9F). Rocking grates, self emptying ash pans, self cleaning smoke boxes are used to reduce maintenance requirements and copper fire boxes are used as these are less prone to corrosion compared to steel. Two cylinders with outside valve gear are sufficient so that there is little need to access the space between the frames for maintenance. Roller bearings are used on the driving and bogie axles and mechanical lubricators are fitted. High efficiency, in steam locomotive terms, is obtained by a high degree of superheat, long lap and valve gear and the largest possible steam passages. The drawing offices at Brighton, Derby, Doncaster and Swindon were each allocated the design and production of standard drawings for certain components for all the range of engines to ensure uniformity. The production of the general arrangement drawings for each class were allocated to a particular D.O. and Doncaster was responsible for the Class 5. The whole process was under the supervision of E.S.Cox as Executive Officer, Design. Many of the components were identical with or followed selected designs from the companies which were deemed to be the best. However in the case of the Class 5 the design was derived from the LMS "Stanier" Class 5 which incorporated many GWR features brought over by Stanier when he moved from the GWR to the LMS.

Many features of the Class can be traced to the Saint class of the GWR introduced by Churchwarden in 1902. The locomotives designed by George Jackson Churchwarden carried the GWR to a place of pre-eminence. He began as a trainee with the South Devon Railway which became part of the GWR. He rose to be William Dean's chief deputy at Swindon and fully took over on Dean's retirement due to ill health as Locomotive, Carriage and Wagon Superintendent in 1902 (GWR did not adopt the title of Chief Mechanical Engineer until 1916). He introduced a 4-6-0 locomotive, No.100, as the first of the modern locomotives which was a precursor for the Saint class and was the forerunner of all the famous GWR express locomotives which all had conical boilers and Belpaire firebox.These were introduced in 1903 on the outside framed City class 4-4-0 locos of which the City of Truro broke the 100 mph barrier in May 1904 at 102.3 mph. These designs were said to be 15 years ahead of the field. Churchwarden had understanding of importance of adequate smoke box layout and fine tuning of blast pipe, high boiler pressure, max. utilisation of firebox heat, piston valves of generous travel and lap, unimpeded steam passages and common components. The Saints had two outside cylinders with inside Stephenson motion, taper boilers and Belpaire fireboxes and were designed as express locomotives with 6ft.8in. driving wheels. Churchwarden's successor, Collett, produced a mixed traffic version, the Hall class with 6ft driving wheels.

William Arthur Stanier was a GWR trainee entered the Swindon DO in 1897 and eventually became Collett's assistant and latter the Chief Mechanical Engineer of the LMS in January 1932. The further development of the Saint/Hall designs took place under Stanier at the LMS with his Class 5, the Black 5, all purpose 4-6-0 locomotive. These used outside Walschaerts motion and high superheat again with 6ft.driving wheels as in the Halls. There were several variations of the Black 5 with various combinations of Caprotti poppet valve gear, roller bearings, double blast pipes and even one example with outside Stephenson valve gear(4767 "George Stephenson" NYMR). These were all major modifications including what might appear to be the fairly straight foreword task of fitting roller bearings. However, the Cannon type of axle incorporating roller bearings has a somewhat larger diameter than the plain bearing axle so that to clear the firebox it was necessary to increase the frame length between the driving and trailing axles. The effect of the modifications was to increase the

weight of the engine from 72.1 to 73.5 tons. The eventual outcome was that the BR Class 5 engines were designed with roller bearings with 6ft.2in. driving wheels.

Construction of the BR Class 5 was over a period 1951 to 1957, 42 at Doncaster (73100-124, 73155-171) and 130 at Derby. 30 of the Derby had Caprotti valve gear (73125-154). 10 (73080-089) of the engines built at Derby and 10 (72110-119) built at Doncaster in 1955 were specifically for the Southern Region .

The cost per engine and tender are quoted as £21,750 and £22,783 respectively at Doncaster and Derby. 73082 was completed on 27th June 1955 but was not named until August 1959 when, at a staff suggestion, the names of the withdrawn Southern King Arthur class engine were transfered to the 20 Southern Region Class 5s and 73082 received the name "Camelot". Withdrawal of the class took place over the period November 1964 to July 1967. "Camelot" was sold to Woodham Brothers scrap yard in Barry and arrived there in October 1966 having been withdrawn in June. "Camelot" is the only Southern Class 5 to survive and only 4 other examples have survived including one with Caprotti valve gear. 18 of it's predecessors the LMS "Black" 5 have survived but 842 were built over the period 1934-50 compared with 172 for the BR Class 5.

Restoration

Over 200 engines went to the Barry scrap yard and they would all have been cut up for scrap but for the Woodham Brothers putting them away for a rainy day and the various individuals and groups of "nut cases" who with more enthusiasm than realism decided to intervene. I suspect few, if any, of them appreciated the Supreme Effort which would be required to return the engines to working condition. The efforts of a small group of members of the Camelot Locomotive Society are probably reasonably typical of many groups in the restoration story.

Two enthusiasts visited the Barry yard in early 1974 at a time when only one Class 5 locomotive was in working order and one had been saved for preservation. "Camelot" was the only remaining named Southern Region Class 5 and this was considered to be good reasons to seek to save the locomotive. The "Camelot Locomotive Society was formed with 3 members in March 1974 with a view to raising money to purchase and restore "Camelot". The fund raising was not able to keep pace with the market price of scrap and the purchase price rose from £4500 to £8100 + VAT before "Camelot" was bought on 31/1/79. This was made possible by loans from members and the bank but this did not include a tender. The suitable tenders (BR1B) at the scrap yard had been sold previously to a local steel works for use as ingot carriers after removal of the tanks. Prior to the purchase of "Camelot" the steel works were shutting and the tender chassis were being cut up and fed into the blast furnaces. However, the group were in time to save one chassis and buy it for about £500 before Camelot had been purchased. Without this purchase the whole idea might have been abandoned. Camelot had been painted and greased to reduce deterioration whilst the money was being raised but no other work was possible at the Barry scrap yard other than the collection of parts from unreserved engines with a van body for storage.

Bluebell Railway had helped in obtaining the tender chassis and as a result they were persuaded to agree that "Camelot" could come to Bluebell. After more money was raised she was transported to Bluebell Sheffield Park on 24th/26th October 1979 together with Sir Archibald Sinclair a Southern Bulleid Battle of Britain Class 4-6-2.

Work commenced in 1980 on the tender chassis which was in poor condition and the frames were bent in at the top due to ingots dropping on to and bending the cross members. The cross members were cut out and the frame jacked upright and new cross members fitted. The wheels and axles were sent to Ashford Works for reprofiling of the tyres and ultrasonic testing of the axles. The roller bearing were found to be in good order in inspite of the steel works battering. The springs were sent to Swindon for retempering and various

missing standard BR parts were obtained from scraped diesel locos at scrap prices. Brake system parts and some other parts were were obtained from other groups at Bluebell but forgings had to be obtained and machined. The frames were needle gunned to remove rust, missing parts were welded in place and painted. The chassis was railed in August 1984 but this work was not finally completed until 1991.

The tender tank construction was put out to a shipyard in Essex who were looking for work outside shipping and had already made a tank for another group. The new tank was of all welded construction but ,as the original was mostly riveted, dummy rivet heads were glued in place. However, later it was found that some were dropping off so rivets were placed in drilled hole and welded on the inside.The tank was delivered in February 1985 and fitted to the chassis. Final painting and lining out was carried out in 1995. Some work on the locomotive was also started in 1980 when the superheater elements were removed from the boiler. This was very difficult as they were jammed in the tubes with encrusted ash. The boiler cladding was also removed and the outside chipped to remove rust and painted with bituminous paint. The old cladding was stored for for later use as a pattern for new cladding. Major work on the locomotive did not start until mid 1985 when the running boards, cab and other parts were removed to allow the boiler to be lifted which was carried out in November 1985. During 1986 the outside of the boiler was needle gunned and painted. All the flue tubes were removed and the inside was cleaned out using high pressure water jets which removed a large quantity of old scale. All the 152 small tubes were replaced together with the 28 superheater flue tubes. The firebox end of the superheater flue tubes are bottle ended and the bottle ends were cut off and welded on to the new tubes. The use of bottle ends reduces the size of the hole in the tube plate so as not to weaken the plate but at the same time allows the use of large tubes to accommodate the superheater elements and to give a lower gas speed for high heat transfer. The bottle ends are screwed and expanded into the tube plates. The smaller tubes are expanded and all the ends in the firebox are turned over to protect the ends of the tubes. The bottom four rows of the tubes in the smokebox are also turned over for protection from the hot ash which builds up in the bottom of the smoke box.

The firebox is of copper and there are over 1000 stays between the firebox and the outer wrapper to support the flat surfaces. The pressure puts the stays under tension but they can also be subject to bending due to differential expansion between the firebox and the steel outer wrapper. Those on the vertical faces are of monel metal (70Ni/30Cu,40t/in^2, corrosion resistant) and arsenical copper (0.3/0.5A,14/25t/in^2) and are screwed into the firebox and outer plates with a waisted section in the water space.

The more ductile copper is used in the areas where the stays are subject to bending. The stays are caulked on the outside and in the firebox using a pneumatic hammer with a 7 lobe tubular tool which fits over the stay end. This is except for the copper stays which are riveted over on the outside. Sacrificial steel nuts are screwed on the stays inside the firebox and 125 were replaced due to burning. The longer crown stays in the top of the boiler are of steel and these are nutted on both the outside and in the firebox. The rear lap joint seams in the firebox were also burnt back close to the rivets but the burnt areas were built up by welding and the rivets were drilled out and replaced with patch screws.

Considerable work was done on the smokebox to repair or replace corroded or broken parts including replacement of the door ring. Some spare superheater elements had been obtained and these together with the best of the existing elements made up a complete set of elements. The refurbished boiler passed an hydraulic pressure test on the 19th April 1993.

A fairly major job was to make up new cladding for the boiler and cylinders to replace the badly rusted original sheets which were kept as a templates for the cutting of new sheets. This work was undertaken by the Mausell Locomotive Society which has several working

members based at Bluebell. It is not too easy to handle large sheets of thin steel on top of a boiler to fit around the taper of the boiler barrel and the belpair firebox.

Meanwhile after the boiler was removed from the frames dismantling of the chassis continued and the final stage was reached on 14th.March 1987 when the frames were lifted off the wheels and bogie. The frames and wheels where needled gunned and painted and the driving wheels were sent to Swindon for reprofiling. A minimum of metal was removed as the tyres were well worn. The axle, roller bearing cannon box and wheel assemblies were not dismantled and the roller bearings were considered to be in good condition. The rubbing surfaces on the cannon boxes were ground to remove corrosion and to true them up. The bogie wheels and axels were similarly refurbished but the wheel sets were sent to Ashford for their reprofiling.

The driving axle box guide liners were ground flat and reshimmed to give correct clearance in the horn guides.One horn guide was loose in the frame and the was refitted with new fitted bolts.The flexible cross frame stretchers were rebushed.

The start of the reassembly was marked by the rewheeling of the frames on the 9th June 1990. This was quite a tricky operation with the frames dangling on a mobile crane trying to manoeuvre the horns down over the cannon boxes on their roller bearings not forgetting the bogie, and then fit the spring hangers and keeps. The brakes where then assembled on both the engine and tender which was coupled up to make use of the hand brake on the tender to control the free running on the roller bearings. No hand brake is fitted to the engine.

The lubrication and sanding pipework, was completed whilst easy access was available with the boiler out of the way. The lubrication system is quite extensive to reduce the running maintenance work. A lubricator is located on each side of the engine at running board level just behind the cylinders and these are driven by a ratchet with a driving rod from the valve motion. One lubricator feeds steam oil to the cylinders and the valves and this oil is mixed with the steam which before entering the cylinders or piston valve chambers. The other lubricator feeds the main and valve slide bars. In addition 30 grease nipples are located in accessible positions with pipes feeding such locations as the main and bogie horn guides, the bogie rubbing plate and parts of the valve motion. Greasing is carried out at the same time as the boiler is washed out which is done every 21 steaming days. Snifter valves,cylinder and steam chest drain cocks etc were also overhauled and refitted.

The cylinders and valve chests had not been disturbed prior to dismantling and the pistons and valves where found to be in good condition.Some grinding was done on the cylinder bores and new rings were fitted to the pistons and valves. If necessary, Bluebell, have facilities for reboring cylinders and valve chests in-situ but this was not required. Splitting the crosshead / piston rod taper joint requires a special tool to jack the joint apart. This is attached to the connecting rod side of the crosshead after removing the rod and is a screw operated grease filled hydraulic jack. A difficult joint can part with a bang.

Camelot had been stripped of it's coupling rods, connecting rods, return cranks and return crank rods. However two coupling rods and a connecting rod were obtained before Camelot was purchased and the remaining coupling rods and one return crank rod were obtained from other preservation groups. This left one connecting rod, the return cranks and one return crank rod to be manufactured by outside workshops. Unfortunately the new connecting rod was found to be bent but the Bluebell workshop was able to straighten it using their recently completed in-house 50 ton press.

The boiler was returned to the frames in 1993 which enabled the mass of pipework and fittings which hang on the boiler and running boards to be erected. This includes the two injectors mounted below the cab on the fireman's side (right), blower and all the valves and

fittings in the cab. It was decided that as the old cab was in poor condition it should be replaced using the old plates as templates for cutting new plates.

Camelot was taken into the Bluebell Locomotive Workshop in March 1994 for the final stages of it's restoration. The main task of was the completion of the motion including the white metalling and machining of the bearing bushes of the rods and the cross heads and machining new gudgeon pins. Various non-ferrous fittings had been acquired over the years but some of these were found not to be up to standard and it was necessary to make new parts or to borrow standard BR parts from other groups until such time as new parts could be manufactured.

The cab caused some difficulty due to the curved roof with it's sliding ventilator. The cab is comparatively luxurious giving good weather protection, when going foreword, and having seats for both the driver and fireman. The fireman does, however, not have much time to sit down what with tending to the fire and injectors and keeping a look out on the right hand side of the engine.

Painting had been commenced before Camelot came into the workshop but the final rubbing down and the application of the final coats and lining out could not be completed on the engine until the reassembly was near to completion. This final painting was mainly carried out by the specialist part time and volunteer painting gang in the workshop. Eventually everything came together and Camelot was rolled out of the workshop on the 16th October 1995 and the fire was light at 10.20am on the boiler which had not been in steam for 29 years. Steam was gradually raised and at 4.20pm sufficient was available for her to move into Sheffield Park Station and to be shunted up and down for the benefit of a film crew which happened to be filming at the Station. Some minor problems became apparent but she was returned to the yard ready for the Boiler Inspector the next day. The inspection covered the raising of the full pressure of 225 psi and the setting of the two safety valves all of which was approved by the Inspector. She was then gently taken to Kingscote with one van in tow. The piston rods were found to be getting warm, the whistle valve was leaking, the steam brake cylinder was passing excessive steam and the regulator was passing steam when shut. These fault were attended to but the most important one, the leaking regulator valve, required the opening of the dome to remove and dismantle the valve for grinding the mating valve faces. The load test could not then be carried out until the 26th October after a light load run the previous day. Apart from a few minor problems all was ready for the official reinauguration on the 28th October. This went well except that the carriage steam warming valve failed when the train was assembled at Horstead Keynes. This over pressured the heating pipe and burst one of the inter carriage hoses. The steam supply to the valve was cut off and the carriages were unheated for the rest of the day. I doubt that anybody noticed in the excitement. Camelot has been in service since then, apart from the winter breaks, and has run some 12,000 miles.

Why did it all take so long? Camelot came to Bluebell in October 1979 and was not back in service until October 1995. The constraints were money and manpower. The Society has very few working members and they could only normally work on the engine at weekends. However the dedicated core of the Society are the fund raisers who took the sales stall to all the special events and meetings in the steam preservation movement weekend after weekend in the spring, summer and autumn. The rate of fund raising matched the rate of possible work on the engine with the limited manpower so that only slow but steady progress was possible.

I feel that the restoration of Camelot can justifiably be classed as a Supreme Effort by a dedicated small band of people who have kept with it from 1974 and are still working to raise money to keep up with the maintenance of the locomotive which will include the 10 year overhaul in 2005.

My thanks to the 73082 Camelot Locomotive Society for the use of information from their publication "From Barry to Bluebell" as the basis of this talk and to the Chairman Peter Gibbs for the loan of the slides. My thanks also to the Staff of the Bluebell Workshop for answering all my questions.

Geoffrey Picken

Mature drivers' seminars

A group of RCEA members enjoyed a full, very interesting and informative seminar, organised by Worthing Road Safety Unit, on 18th June, 1996.

The agenda dealt with:

1. Vision: Visibility and the Driver
2. Insurance: Perks and Pitfalls
3. Traffic Law: Latest changes
4. Traffic Calming
5. Mobility Aids
6. Medicines and the Driver
7. Driving Techniques

Full opportunities were given to question all the presenters, including the Insurance Company Representative, the Police Accident Prevention Unit and the Police Accident Investigation Unit.

There was an optional eyesight test using sophisticated testing equipment, and a reaction time test. Measured reaction times averaged 0.7 seconds, equal to a distance travelled of 60 ft. (18 m.) before brakes are applied at 60 mph.

Some members found the latest copy of the Highway Code made novel and interesting reading!

Overall very good value for £6, including morning coffee and a buffet lunch.

A further option taken up by most members was that of a one-hour assessment drive with a qualified member of the Advanced Motorists. A written report of these drives was provided, identifying good and bad aspects of one's driving. Where members and their wives separately took these tests, it offered a new basis for conversation when driving together!

John Wigley

The seminars are being repeated 16th to 19th June and will cost £7 per person. Application form on page 15.

Outing with Ladies to Filching Manor & Michelham Priory, East Sussex, on the 18th June 1997.

This is an all-day outing with activities of interest to both Members and their Ladies. We start at Filching which houses a Museum of artefacts, many devoted to speed records and includes record making boats and the mock-up of Campbell's Bluebird used in the television program about Campbell, starring Sir Anthony Hopkins. After Filching Manor we go to Michelham Priory for lunch and subsequently visit the house and gardens

We meet at Filching, using our own transport at 10.30 am, where we will be received by Paul Foulkes-Halbard, the owner and curator for coffee and a short talk, before making our way around the exhibits from 11.00 am until we leave at 12.15 pm. The exhibits are housed in a series of sheds on the site and includes one devoted to Campbell family memorabilia, with the full size mockup of the last Bluebird boat housed separately.

We are scheduled to arrive at Michelham for lunch at 1.00 pm, after which participants can visit the house and gardens and, if they so wish, partake of afternoon tea at their own discretion and time.

Michelham Priory is surrounded by England's longest medieval water-filled moat, where the remains of the ancient priory are incorporated into a splendid Tudor mansion. A rich diversity of gardening styles provides interest throughout the seasons, which includes a re-created medieval cloister garden which was the subject of a recent television programme. On the south side is a physic herb garden with spacious lawns giving way to orchard and borders leading to the waterside. Elsewhere in the grounds are a watermill, an Elizabethan barn and a 14th century gatehouse.

Inside the remaining priory buildings and Tudor house are collections and exhibitions tracing the religious origins of Michelham through to its life as a working farm and development into a country house. Exhibits include tapestries, furniture, kitchen equipment and a fully-furnished child's bedroom from the 18th century.

The lunch menu and seating has been secured by prior arrangement and lunch is called a Miller's Platter. This comprises a small loaf of home made Priory bread filled with home-cooked ham and local cheese, garnished with salad, followed by fresh fruit and coffee and cream.

The all-in price, including entry to Filching Manor plus entry to and the arranged lunch at Michelham Priory is £12 per head, payable in advance.

Applications to attend together with cheque payable to RCEA must, be with Ken Wheeler by Thursday, 12th June, 1997.

Outing with Ladies to Submarine World and HMS Warrior, on the 16th July 1997

This is an all-day visit encompassing the Submarine Museum at Gosport and HMS Warrior in Portsmouth Harbour.

In 1860 HMS Warrior was the most modern warship afloat and she has now been restored to her former glory. There staff, many of whom are volunteers, will show us around.

At Gosport you can go inside a real submarine if you wish (through a hole in the side, not down the conning tower) and there are many other items on display and there is a cafe. It takes about 2 hours to visit this site.

Itinerary

Proceed to Portsmouth Harbour in own transport via the M275; follow signs for Historic Ships and use car park at the end of Hards Road. We all meet in the car park at 10.30 am prompt as we have a timed visit to HMS Warrior. We then walk to the Gosport Ferry (about 5 minutes) and take the next across. We enter the Submarine Museum and stay for a period at your discretion. It has been suggested to me that the local pubs in Portsmouth Harbour provide the best lunches, although there is a restaurant on site, if it suits you better. We have to be at HMS Warrior at 2.30 pm where entrance is on a timed basis for our group. The visit concludes after visiting HMS Warrior.

The price of £5 per head, which has to be paid one month in advance, is for car parking and entrance to HMS Warrior. It excludes ferry fares, all meals and entrance to Submarine World, which will be an additional £2 per head, payable on the day.

The latest date for applications is Monday, 2nd June, accompanied by a cheque for £5 per head payable to RCEA.

Footnote: There is an opportunity to take a boat trip round the harbour later if you wish.

Outing with Ladies to Tenterden, on the 20th August 1997

If you like looking around English towns and you have not been to Tenterden, then you are in for a treat. Tenterden is a popular town for visitors. Its streets in general are level and wide, but car parking is difficult, due to the influx of visitors. The solution, use the train from nearby Northiam Station

This is an all-day visit where, on arrival by our own transport at Northiam station (which is on the A28) for coffee at 11.50 am, we catch the 12.20 pm Victorian steam train, travelling First Class to Tenterden Town station, arriving at 12.55 pm. The station is in the town just off the centre. Tenterden has several interesting features, including a church and a picturesque high street with a variety of shops including antiques and bric-a-brac and there are good places for lunch. The bad news for Members is that there are two very nice dress shops. It is a town on the "tourist trail" so don't delay in sorting out where you are going to eat. We return on the 3.30 pm train, travelling First Class, arriving back at Northiam station at 4.03 pm, at which point the visit ends.

Members may like to know that other places to visit on a fine August evening include Bodium Castle and the possibility of a boat trip to Bodium from near Northiam station. Also, National Trust members will be aware of Ellen Terry's house in the area.

The visit includes return rail fare but excludes lunch and any other refreshments. It is suggested that car sharing will help with car parking at Northiam which I understand is free.

Applications to be with Ken Wheeler by 6th August latest, with cheque made out to RCEA on the basis of £7 per head.

To: K.J. Wheeler, 14 Musgrave Avenue, East Grinstead, RH19 4BS Tel: 01342 321291

I wish to participate in the outing to **Filching Manor & Michelham Priory** on Wednesday, 18th June, 1997.

Full Name .....(Block capitals)

Address .....

.....

Phone No..... **Applications by 12th June, 1997**

Number of persons..... Cheque payable to RCEA at £12 per person enclosed

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To: K.J. Wheeler, 14 Musgrave Avenue, East Grinstead, RH19 4BS Tel: 01342 321291

I wish to participate in the outing to **Submarine World and HMS Warrior** on Wednesday, 16th July, 1997.

Full Name .....(Block capitals)

Address .....

.....

Phone No..... **Applications by 2nd June, 1997**

Number of persons..... Cheque payable to RCEA at £5 per person enclosed

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To:K.J. Wheeler, 14 Musgrave Avenue, East Grinstead, RH19 4BS Tel: 01342 3212917

I wish to participate in the outing to **Tenterden** on Wednesday, 20th August, 1997.

Full Name .....(Block capitals)

Address .....

.....

Phone No..... **Applications by 6th August, 1997**

Number of persons..... Cheque payable to RCEA at £7 per person enclosed

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