NEWSLETTER

RETIRED CHARTERED ENGINEERS ASSOCIATION
WORTHING

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

FORTHCOMING EVENTS

5th April	Wednesday	**Visit** to Ordnance Survey, Southampton see pages 8 & 13 for details and signing up
15th May	Monday	**Outing** to Sotheby's, Billingshurst see pages 9 & 13 for details and signing up
14th June	Wednesday	**Outing** to Christ's Hospital, Horsham see pages 10 & 15 for details and signing up
18th July	Tuesday	**Outing** to Houghton Bridge & Boat trip see pages 10 &15 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 5 Apr, 3 May, 7 Jun, 5 Jul, 2 Aug
Three Crowns, East Preston	Third Thursday of the month 20 Apr, 18 May, 15 Jun, 20 Jul, 17 Aug
Beach Hotel, Worthing (with Ladies)	Last Thursday of the month 30 Mar,27 Apr, 25 May, 29 Jun, 27 Jul, 31 Aug

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

Committee meetings

Wednesdays at 2.15 p.m., Durrington C.C., on 29 Mar, 17 May & 9 Aug

Copy date for next Newsletter 15 Aug

Corrections to last Newsletter

Please note errors in the information given about our new members:

J.D. Brakell 01903 762083, **L. Marson** 01903 859802 and **G.H. Picken** lives in Faircox Lane.

East Preston Coffee mornings

The "Three Crowns" public house has re-opened under new management. As from and including 20th April we shall partake coffee at the Three Crowns. The dates are given on the front cover of this Newsletter.

Volunteers required

The Engineering Council is seeking volunteers to help man its stand at a Careers Exhibition on 22nd March (Faraday Lecture day!) at the Brighton College of Technology, near Brighton Station. All day, but attendance negotiable (say 2 hours). Contact John Brock, Tel. 01424 812521.

Cancer Research Campaign.

A total of £56.83 was handed over to the organisers from the copper collections made at coffee mornings during 1994. The organisers thank the RCEA for this contribution.

Bob Collard

Things that go wrong talk by F.J Adams, member, on 14th December, 1994

Mr. Frank Adams, has hearing problems due to an industrial injury. As a consequence, he had not previously attended one of our meetings and I am therefore most grateful to him for filling a gap in the year's programme.

In Engineering we apply human activity to make things and, in the process, inbue them with every human failing going. Frequently the problem is not to find what has gone wrong, but why. It has been known to be due to a department taking action to which it is not entitled. Unfortunately universities only teach the Science of Engineering, mainly because you can prove it. When we have the opportunity to apply this "science", we slowly lose the technical side, its giving way to experience.

Going back in time, examples of mistakes made with otherwise good design were cited. Isambard Kingdom Brunel's Great Western was stuck on the slips for a long time, until they found a way to get it launched. As for his Vacuum Railway in the West Country, it worked perfectly well until the rats started eating the seals. Pictures were shown of the Taybridge disaster, which was eventually found to be due to various faults in both manufacture and construction.

An example of a modern disaster is a Boeing 747, where the rear pressure bulkhead collapsed on the landing approach, shearing the flight controls, whereby it was only possible to fly in circles which was done

until the fuel ran out and then the plane crash-landed. The fault was traced to rivetting being carried out improperly during maintenance.

Problems with domestic electrical products, which are made in their thousands, were discussed. In the case of an electric kettle, total production 165,000, fires in five were reported three years after the sale of the last kettle. Since kettles are used, say 1,000 times a year, this meant that five kettles had caught fire in 495 million operations. Politically they had to carry out laboratory tests, but they knew that this would not provide the answer, due to the enormous number of operations required. The cause had to be found by reasoning out, based on the fact that all fires occurred at night, being preceded by a loud "pop". It was eventually ascertained that steam got through a very fine gap, condensing and then arcing across two terminals.

Many other examples were given, and those members who were unable to attend are recommended to borrow from the Secretary the tape that was made of this most interesting afternoon.

Stan Renew

Revolutions; past present and future - Discussion meeting led by S.R.Renew, member, at the Durrington Community Centre on 8th February, 1995

High Speed Turbo Alternator

Brief talk on the development of a turbo alternator to provide an output of 200 V 3 phase 50 W at 5,000 Hz. Unit shaft speed 300,000 r/m all to fit in a space 1.25" dia x 0.875" long. Unit to provide the power supply for doppler radar and proximity fuse system fitted in the nose of a 3.7" dia. anti-aircraft shell. The air pressure on the shell nose during flight (average speed about 1,000 mph) to drive the unit turbine.

Unit must also withstand an acceleration force axially of 15,000 g for 10 ms as the shell accelerates up the gun barrel.

Main area of development concerned the rotor bearings which must have a minimum life of 20 minutes. Final bearings of sintered bronze with molybdenum disulphide plating and a ground steel shaft. Average run life 90 minutes, allowing ample time for production, testing and shelf life testing. Shell flight time to 15 miles altitude is about 1 min. so the bearing life was more than adequate. *Eric Roubaud*

The Electricity Revolution

If Revolution is defined as "fundamental change", the initiator of the Electricity Revolution was undoubtedly Michael Faraday. His demonstration of electro-magnetic induction to the Royal Society in 183l opened the door to large scale generation and utilisation. Initially seen only as a source of (arc) lighting, electrical development was restricted by vigorous opposition from the gas industry and the impositions of the 1882 Electricity Act. Expansion rate increased with the invention of the incandescant lamp (Edison and Swan, 1878) and was boosted by the arrival of the Parsons steam turbine - first installation in 1888. In the first five years of the 20th century use for lighting doubled, while power load increased twenty times.

There have been no fundamental changes since Faraday, though advances in materials and design have been continuous, leading to the "big is beautiful" philosophy of the the 1970's and 80's. There have been new

fuels - oil, nuclear and gas - the last impinging on the economies of scale and offering improved efficiencies in CCGT and CHP plants.

We await the ability to convert fuel to electricity directly (nuclear fusion?, fuel cell?). Meanwhile conservation of energy must surely be the theme by exploiting renewable sources, whilst minimising use of those which are finite. *Ernest Ayling*

Revolution

Did our forefathers, in the 1800's, realise the revolution that was taking place at that time. Historians called it the Industrial Revolution. Mechanical power was driving out the handicrafts, steam engines were replacing manual labour, larger units of production were replacing cottage industries. Workers were migrating from the country to the cities. The coal mining and the steel and iron industries developed. To provide transport for the workers and the movement of goods, the railway system was built and developed.

This was a period of great invention and innovation. A most significant factor was that of Faraday in 1831 when he discovered the link between magnetism and electricity and laid down the foundations for large scale generation and distribution of electricity.

Revolution mirrors economic boom and depression. Periods of war accelerate inventivity - the 1939 war two good examples - RADAR and radio direction finding produced the foundations for the advances in electronics. The German's development of rocketry, exploited by the Americans, has led to remarkable feats; men on the Moon, exploration of space, telescopes in orbit, etc. Communication satellites are now common place .

It's easy today to marvel at what is happening in our life time and like our fore fathers, perhaps, not be aware that revolution is still taking place at an accelerating rate due to man's insatiable demand for more and more knowledge.

Electricity was one of the great advances of the 1900's - without electricity where would the seemingly exponential growth of the electronics industry be today? Television pictures that were black and white in the late 40's are now in glorious colour with higher standards of definition. An inordinate number of channels if we invest in a satellite receiver and developments in the pipe line for higher definition, wide screen to match the cinema format. Home computers operate at incredible speeds; discs and hard disc drives are being replaced by CD Roms. They all depend on the availability of electricity; witness what happens in a supermarket when the electricity fails - in fact the whole business comes to a stand still. So perhaps our revolution has its own Achilles heel ?

Digitising has led to great advances in communication. Copper conductors are no longer needed, as fibre optics can transmit signals in the form of pulses of light with none of the electromagnetic side effects associated with metallic conductors. Infra-red and radio operated controls enable you to switch on your television set or lock your car. Radio telephones are becoming common place. Satellites are beaming down streams of electromagnetic radiation from outer space. The air is alive with radiation of one type or another. For example, there is now concern about radiation from mains overhead lines. Perhaps the radiation and revolution will become inextricably linked in the years to come.

Medicine is revolutionising too! Spare parts surgery is becoming common place - heart and kidney transplants - replacement joints - increasing dependence on a range of drugs to cure or alleviate our ills. Sophisticated mechanical and electronic engineering developments enable surgeons to operate through a keyhole size incision, lasers enable operation involving cutting or cauterisation to take place without a human hand touching the patient. Research into what makes us tick goes on a pace - DNA fingerprinting, gene discovery and manipulation. Perhaps Hitler's dream of the perfect race will become a reality.

The industrial revolution has not ended - it is accelerating, as invention develops new materials and processes introduce new tasks or replace old tasks in a new way. The key is the availability of power - nuclear was seen as the key to cheap electrical power, as yet this has not been realised due to the fear of radiation after effects - unlimited fuel from the oceans using fusion is still man's dream. Yet we are using the fossil fuel reserves of oil, gas and coal, reserves that took billions of years for nature to lay down, at a profligate rate. Revolutions driven by man,s inventiveness perhaps power or, more correctly, the lack of it, will be its downfall.

John Fuller

Ken Wheeler spoke about the Industrial Revolution, starting in 1735, where the need for increased rotary shaft power was supported by the inventions and economic innovations of Kay, Watt, Arkwright and Darby in the U.K. Successive technological exploitation by the Victorian engineers made Great Britain the major trading country until around 1870. The talk to be given on the 4th October will show how elementary control theory, coupled to inventions of the past, assists strategic decision making in the industry to-day, and will include the development of the aero gas turbine engine.

The Electronics Revolution

Marconi began experiments in wireless transmission in 1894, achieving ship and transatlantic communication in the early 1900's. To produce audible messages, devices such as crystals and diodes were used to rectify the received radio waves. The diode, invented by Fleming of the Marconi Company in 1904, consists of an evacuated glass envelope containing a cathode which emits electrons when heated by a filament, the electrons being attracted to a second electrode, the anode, at a positive potential to the cathode.

The diode was the first truly electronic device and was followed in 1907 by the Lee De Forest triode, in which a small voltage applied to a third electrode, the grid, could become amplified at the anode.

In the late 1940's, work by Shockley of Bell Labs. on germanium and silicon crystals with specified impurities resulted in semiconductors, in which current is carried by both electrons and holes (positive charges). In the form of transistors, small signals can be amplified and large numbers of these devices can be integrated on silicon chips to process digital pulses and form megabite memories for computers.

Other advances include the use of electro-optics with fibre optic cables, infra-red detectors and bar code readers, ever higher frequencies in radio communication, the digitisation of analogue signals from audio and video sources and automatic control by microprocessors of mechanical systems, such as electronic gear boxes, robots, compact disc players, video recorders and automatic cameras.

Lindsay Mole

Star Trek plan for a non-lethal weapon. Article extracted from 'The Mail on Sunday', 25th September, 1994.

Pentagon war-lords are investing in a new generation of weapons that disable the enemy without killing. Just as Star Trek's Captain Kirk put his phasors on stun to immobilise intergalactic villains, laser rifles could soon be used by U.S. Forces.

The new range of high-tech weaponry, including super glue sprays and noxious stink-bombs, is being greeted as the biggest break-through in combat since the slingshot. Scientists sought out less violent solutions amid fears over civilians killed in world flashpoints.

Pentagon-speak for the gadgets is NLW's - Non Lethal Weapons - and the race is on to design and equip all branches of the services with the best of them before the end of the century.

President Clinton has promised funding, as both the CIA and the FBI agreed that NLW's could have saved innocent lives during the recent "Waco" siege, in which 89 cult members died in a stand-off with federal agents. Defence Under-Secretary John Deutch, has assembled a top-flight team of scientists working under the Pentagon's Director of Technical Services, Frank Kendall. Kendall's research team has come up with one prototype which could be deployed as early as this year - guns which can fire beanbags against rioters, instead of rubber bullets. Lasers, microwaves - used to destroy tanks from miles away - sound waves, strobe lights and electro-magnetic pulses are also being harnessed.

By the end of the millennium, American soldiers could be going into battle with weapons that leave a lot of glue, stink and silver paper - but few dead. *John Fowler*

Visit to New Power Plant at Smithkline Beecham, Worthing

Wednesday, 15th February, 1995.

Some twenty-five members took part in to-day's visit, which was a follow-up to the earlier tour around the pharmaceutical plant. This time we concentrated on the CHP (Combined Heat and Power) Plant, originally seen at the early construction phase, but which is now fully operational.

On arrival we were met by Mike Bendell (Mechanical) and Keith Parsons (Electrical), who explained in great detail the importance of the CHP unit to the Company's future operation. Its output of 18 MVA electrical power and 27 tons/hour process steam at 10 bar serves most of the process plant's requirements, the small deficit of electrical power being supplied as necessary from SEEB, and some 4 - 5 tons/hour steam from SB's existing diesel fired boilers. The latter are available in a standby role, should a major failure of the CHP unit occur. Surplus electrical power generated up to a max. of 3.5 MVA can be supplied back to SEEB when necessary and appropriate.

The natural gas supply contract is interruptable, requiring the CHP unit to be dual fired, either gas or diesel, with a rapid 'seamless' change-over (20 secs being the target time).

Conventional Power Stations have a thermal efficiency of 35 - 40%, whereas this unit operates at about 70%, giving important savings in the final product costs.

The CHP unit is located in the only space available in the centre of the 27 acre site, adjacent to two large diesel storage tanks. Special water dousing of all external tank surfaces was necessary to meet any fire risk, giving rise to large provisions for effluent disposal.

As explained in the earlier report, the prime mover in the CHP unit is a derivative of a U.S. military jet engine running at 7000 rpm driving the main alternator and exciter through a 7 : 1 reduction gearbox. The sound attenuation system was so good that, in the control room, we were able to converse easily within two metres of the jet!

External noise levels to meet environmental requirements had to be 5 dBA below the existing ambient level, with no distinctive tones audible at the site boundaries.

As the turbine requires gas at high pressure, a two stage reciprocating compressor, driven by a 500 kW motor is installed; this necessitates a 480 kW standby diesel generator, should the external electricity supply fail. (The pharmaceutical plant operates 24 hours/day, 365 days/year).

Exhaust gas from the jet engine drives the alternator before passing to the water tube boiler at 530 degrees C and thence to the flue at 160 degrees C.

The unit is owned and operated by Powergen, but can be taken over by SB after five years with a declining cost of virtually zero after ten years.

Due to the limited space available, many problems were faced during construction:

1. No on-site 'Lay Down' space for incoming materials.
2. A high water table and poor ground required extensive piling.
3. The second flue gas chimney had to be placed within 18 diameters of the existing chimney; wind vortex problems necessitated hydraulic damper rings at the top of both stacks.

To maintain the required plant availability of at least 95%, special arrangements exist under the contract with Powergen to have a replacement gas turbine shipped in, installed and in operation within three days of a major breakdown.

Altogether it was a most interesting and enjoyable visit, with an excellent presentation, question session and detailed tour of the power plant.

Stan Renew thanked the Company and, in particular, Mike and Keith for their excellent presentation and for their answers to the many questions. For the non-electrical members, it was suggested that a future visit might be made on the subject of their proposed effluent plant. 'Electricals' sit back!

John Wigley

Spring Break to Jersey 28th May - 1st June, 1995

Some members have enquired about the procedure for handling luggage. BETA TRAVEL advise that suitcases will be taken from home to coach by your included taxi and then by coach to Gatwick Airport. At Gatwick each member will be responsible for taking their own luggage to the flight "Check-in", in accordance with usual practice.

On arrival at Jersey Airport each member will be responsible for reclaiming their own luggage and taking it through Customs to our coach, from where it will be delivered to our hotel rooms.

Your individual air tickets will be sent to you by Beta, together with your travel documents, advising pick-up times, etc.

Luggage trolleys should be available at both Airports but, as you may know, this cannot always be guaranteed, so bear this in mind when deciding whether or not to choose a suitcase with wheels. If any members feel that they require a wheelchair, please contact our courier, Valerie, at Beta Travel, Tel. No. 01903 209007, who will make the necessary arrangements.

One final point, DO NOT FORGET YOUR PASSPORT, just in case you decide to visit France.

John Fowler

Restoration of Oldland Windmill

Help required

Just north of Hassocks (8 miles north of Brighton), Oldlands Mill, an 18th Century Post Mill, is being restored to something approaching working order. The work has been going on for some years and the parts for a new structure have been built and stored on site. The project is threatened because the leader of the team, a retired engineer, is having to give up and there is no obvious successor. Is there anyone "out there" who would be interested in getting involved in finishing this project? Someone with engineering knowledge would be ideal, but they do not have to be a windmill expert. There are several windmill experts associated with the work who can give advice, but cannot get further involved because of other windmill commitments. For more information, please contact Mr. Trevor Davey, Chairman of the Hassocks Amenity Association, 42 Lodge Lane, Hassocks. Telephone 0273 843319.

Visit to Ordnance Survey, Romsey Road, Maybush, Southampton. Tel 01703 792000 on Wednesday 5th April, 1995 at 10.45 for 11.00 a.m.

Despite the address, it is a very easy journey, being located N.E. of the city, a short drive from the M27 and therefore we hope for a good turn-out.

In view of the nature of this Organisation's activities, they have found that presentation of information is best done via an exhibition centre and, as a consequence, much of our time will be spent in this area. Subjects that will be covered are:- history, map markings, ground survey, aerial survey, digital mapping and its application, plus map printing.

Since our tour will finish around lunch time, they would be happy to make their staff restaurant available to us. It is appreciated that some members may not wish to take advantage of this offer; therefore it is essential that your preference is clearly indicated on the application form.

Numbers are limited to twenty, but you will only be contacted if your application is unsuccessful. **Replies by first post Monday, 3rd April.**

Stan Renew

Outing with Ladies to Sotheby's Country House Saleroom, Summers Place, Billingshurst on Monday, 15th May 1995 at 2.00 p.m.

This Victorian Gothic mansion, which is located on the A29 one mile north of Billingshurst, was built at the end of the 19th century by Roger Goff, as a family home. Subsequently it became a Convent School and then in 1984 it was bought by Sotherby's. It is now the site of the largest fine art auction room outside of London.

The programme will be as follows:-

1. A talk in the board room about Sotheby's, plus comments on items brought by a few of our members. Alternatively, it may be possible to arrange for a short talk on a specific category of antiques, if there is a sufficient number of people with a common interest (45 minutes, approx.).
2. Tour of the house (20 minutes, approx.).
3. Viewing of 'Continental Furniture and Works of Art', prior to auction the following day.
4. Preview of 'Garden Statuary' scheduled for auction 23rd May.
5. Tea, which can be taken outside, if weather permits.

Professional comments on a member's 'treasure' will be dependant on which specialists are available on the day. You will be advised if it is definite that your item cannot be included.

The total cost will be £9 per head, inclusive of Tea. This figure is based on a party of 15. However, any increase in this number, up to a total of 25, will produce a pro-rata refund. Closing date for applications is Saturday, 15th April.

Note: You will only be contacted if your application is unsuccessful.

Stan Renew

Outing with Ladies to Christ's Hospital School, Horsham on Wednesday, 14th June 1995 at 12.45 for 1.00 p.m.

This school, founded in the City of London in 1552, has a unique heritage. Most of us are familiar with its bluecoat uniform, which dates back to Tudor times. It is a co-educational boarding school of 830 pupils, which moved from the City at the turn of the century.

Our visit will be a guided tour led by one of the pupils, starting in the Quadrangle. We will watch the whole school march into lunch, accompanied by the famous school band, which is frequently chosen to lead the Lord Mayor's Show in November. I am given to understand that the Dinner Parade is a particularly impressive event; however, in bad weather the Band is unlikely to perform.

The tour then takes us through the principal areas of the school (excluding the Museum). In the Great Dining Hall, a wonderful 87 ft. painting by Antonia Verrio fills the length of one side. The spectacular Chapel houses the famous Brangwyn painting and in the Library there is a most important painting of King Charles II, whilst the Court Room has a portrait collection dating back to the 16th century.

The foregoing will take about two hours, after which we will all retire to the splendour of the Dining Hall for a Sussex cream tea.

We are required to park in the Sports Centre car park (arrowed on the map) and assemble at the Sports Centre Reception by 1 p.m. If you are having a picnic lunch, there is no objection to your eating this in your own vehicle in the Sports Club car park. It is also possible to purchase light refreshment in the Sports Club coffee bar, but this cannot be relied upon. Toilets are located in the Sports Centre.

Cost £5.50 per head, including Tea. Closing date for applications Monday, 15th May.

Note: You will only be contacted if your application is unsuccessful.

Stan Renew

Outing with Ladies to Houghton Bridge Tea Garden, near Amberley on Tuesday, 18th July 1995.

Some events in the past have had very poor support and, to avoid a possible embarrassing failure, I have decided not to proceed with the "Visit to a Private Garden", despite the fact that I have already made an arrangement with the owner.

I have, however, an excellent alternative venue, the Houghton Bridge Tea Garden, with good parking facilities. Here we can spend the afternoon socialising on the river bank and taking a boat trip up river as far as Amberley Castle, lasting up to 3/4 hour. Although the boat is limited to 12 passengers, it has extremely good access, even for the less agile. Providing there is reasonably good support, the boat will not be available to the general public that afternoon.

For your further enjoyment, there is also the possibility of several walks by the river, or in the general vicinity. Another attraction of this venue is that the tea room holds up to 90, should the weather be inclement.

The plan is that we should all take tea together but, should you wish to arrive early, there will be a good range of lunches and snacks available. Although prior booking is not required, it would be in our interests to give some indication of numbers involved. Therefore, if possible, please return the form to me a few days before the event.

Stan Renew

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To: S.R. Renew, 11 Chartfield, Hove, BN3 6DS

I wish to participate in the visit to **Ordnance Survey** on Wednesday, 5th April 1995 at 10.45 for 11.00 a.m.

Full Name .....(Block capitals)

Address .....

.....

..... Phone No.....

I do / do not * require to make use of the Staff Restaurant

* cross out inapplicable

Closing date for applications Monday, 3rd April 1st post

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To: S.R. Renew, 11 Chartfield, Hove, BN3 6DS

I wish to participate in the outing to **Sotheby's** on Monday, 15th May, 1995 at 2.00 p.m.

Name .....(Block capitals)

I shall be accompanied by.....

Address .....

..... Phone No.....

.....

I enclose a cheque for £9.00 per person, made payable to RCEA

Closing date for applications: Saturday, 15th April,1995

I would like a talk on.....

For their comments, I would like to bring a.....

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To: S.R. Renew, 11 Chartfield, Hove, BN3 6DS

I wish to participate in the outing to **Christ's Hospital School** on Wednesday, 14th June, 1995 at 12.45 for 1.00 p.m.

Name .....(Block capitals)

I shall be accompanied by.....

Address .....

..... Phone No.....

.....

I enclose a cheque for £5.50 per person, made payable to RCEA

Closing date for applications: Monday, 15th May,1995

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To: S.R. Renew, 11 Chartfield, Hove, BN3 6DS

I wish to participate in the outing to **Houghton Bridge** on Tuesday, 18th July, 1995 at 2.00 p.m.

Name .....(Block capitals)

I shall be accompanied by.....

Address .....

..... Phone No.....

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Number of Lunches required.....

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