

Royal Institution Lantern Lift – Part 1

By Pat Gordon, Optimum Lift Services



This is the story of a remarkable project to return an unusual, old and interesting example of lifting equipment back into service. It began back in February 2012, when Charlotte New, Curator of Collections at the Royal Institution, Albermarle Street, phoned John Nichols, Training Advisor at LITS. Charlottes father, Alan, had also been an Advisor at LITS before retirement, but, more pertinently to the story, John and Alan were both indentured Apprentices at Waygood Otis, although several years apart.

Charlotte was calling to ask for help and advice about the “Lantern Lift” at the Royal Institution, originally installed by Waygood Otis, which had been out of action for some time. John was immediately interested. He had no knowledge of the lift, and only a vague awareness of the Royal Institution and its distinguished history but he rose to the challenge and began to investigate. As he made his enquiries and researched the installation he became fascinated with the Royal Institution and determined to get the equipment running again.

The story will be told in two parts. First, the history of the installation and then, in the second part, a more technical account of the project itself.

The Royal Institution was established in 1799, awarded a Royal Charter in 1800, and has been a hub for scientific discovery, innovation and debate since then. The building in Albermarle Street was purchased in 1799 and work began rapidly making the building into a fully functioning scientific institution with laboratories, lecture theatres, meeting rooms, libraries, and display areas as well as living quarters. The Institution has remained in this location ever since.



The Royal Institution of Great Britain, 21 Albermarle Street.



Faradays Laboratory, which is kept as he left it, in the basement of the RI. (Note the old dumbwaiter in the back right hand corner!)

Its purpose is for scientific study and to improve society’s understanding of science through public lectures and exhibitions.

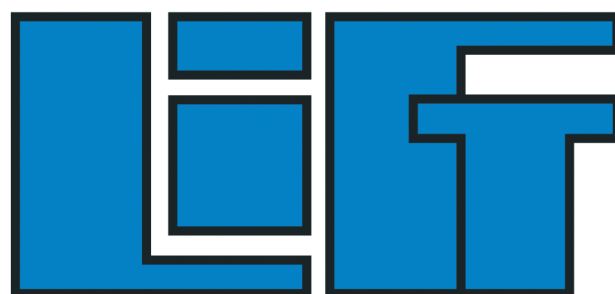
There have been many famous, historic figures associated with the RI – one of the most famous is Michael Faraday, whose experiments at the Royal Institution led to the electric motor, generator and transformer. Faraday was the son of a blacksmith, and his family were Sandemanians, a literalist Christian sect. He was born in 1791 in Newington Butts (near where the Elephant and Castle is today) There are a couple of curious coincidences here: John went to the Beaufoy Technical Institute and was in Faraday House, and the Waygood Otis factory where John and Alan started their apprenticeships was in Falmouth Road, less than a mile from Newington Butts.

Another auspicious connection for John, who is a keen sailor - Faraday was appointed as scientific advisor to Trinity House from 1836 to just before his death in 1867, taking on tasks ranging from analysing lighthouse paint to supervising the conversion of some lighthouses to electric power.

In December 1927, the electrical substation at 21 Albermarle Street exploded, which lead to the demolition and rebuilding of the lecture theatre. Throughout the 1800s, it seems there had been a problem with ventilation of the lecture theatre and the rebuild in 1928 gave an opportunity to improve matters. In particular, the circular glazed roof turret shown on the original contract drawing by Thomas Webster in 1800 was redesigned to have opening windows and a movable internal cupola – the “Lantern Lift”.

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Royal Institution Lantern Lift

– Part 1

The lantern itself is an octagonal structure on the roof of the lecture theatre, with windows to the lower section and brick built walls to the upper section. A wooden floor separates the two, and the machinery for the “Lantern Lift” is housed in the upper half. The cupola or dome is in the lower section, mounted in a frame which can move up and down rails to allow natural light (and, once upon a time, fresh air) into the lecture theatre below. Although now painted white, the dome is made of copper and originally will have reflected the light in addition to allowing it in through the windows.

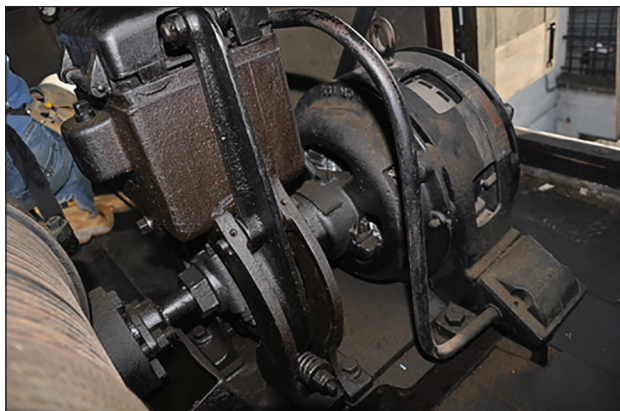
The lifting machinery and control equipment is of Waygood Otis manufacture. A single speed AC motor, with gearbox and drum, and a 1SOS control panel. (1 SOS translates to: Switches, three-phase power supply, squirrel cage motor, car switch) Although some of the paperwork found in the machine room indicates a date of 1927, the installation is more likely to date from 1929 or 1930, when the lecture theatre was rebuilt. (Charlotte has now found a handover notice and invoice dated 31st December 1930.) The lift itself was operated from the lecture theatre – a simple car switch control to go up and down.

At the beginning of the new millennium, 21 Albermarle Street underwent an ambitious refurbishment, which was completed in 2008. Informed readers will know that this left the Royal Institution in considerable financial difficulties. It also left the Lantern Lift inoperative, as the electrical supply was disconnected and the operational controls removed from the lecture theatre – any refurbishment or replacement of the Lantern Lift itself appears to have been omitted from the plan!

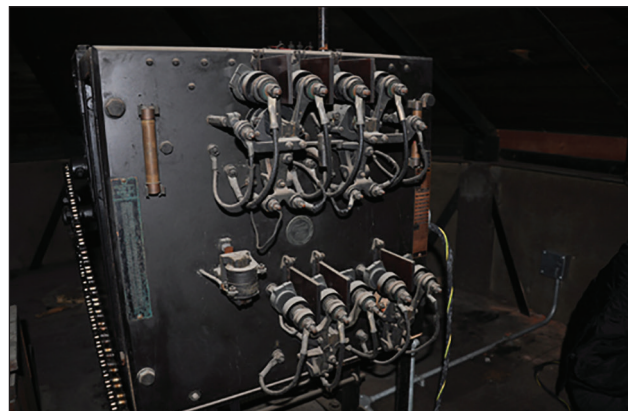
The initial purpose of the Lantern, which was to provide natural light and ventilation for the lecture theatre, is now provided by modern lighting and air conditioning systems, so the inability to raise and lower the Lantern Lift under power was not an everyday issue. However, many of the lectures



given in the lecture theatre include spectacular demonstrations and visual experiments. The Christmas Lectures, which are shown on BBC, are maybe the best known of the public lectures given by the Royal Institution. Often the experiments use apparatus suspended from the roof. There is a steel framework installed at the base of the Lantern for this purpose. With the Lantern Lift in the raised position, the institutions technicians can access the steelwork to set up the apparatus, which they do about half a dozen times a year. (Note for the H&S conscious, there are eyebolts fitted to the Lantern structure for the attachment of safety harnesses!) For several years, since the refurbishment, they had been handwinding the dome up to get access, and then lowering it down afterwards – taking 30 minutes every time.

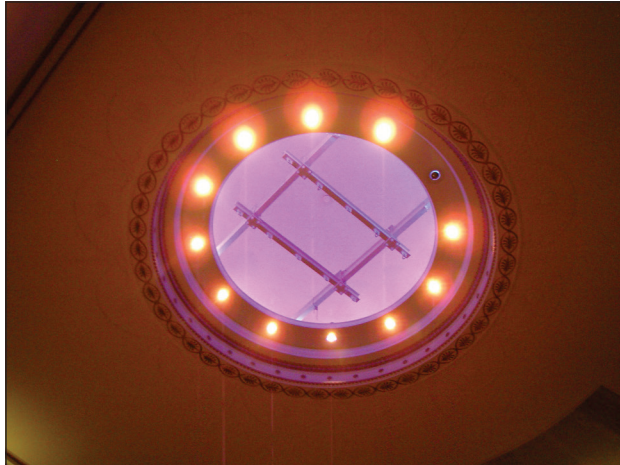


The Lift Machinery.



The Control Panel.

Royal Institution Lantern Lift – Part1



Many of the lectures given in the lecture theatre include spectacular demonstrations and visual experiments. There is a steel framework installed at the base of the Lantern to allow apparatus to be suspended from the roof.

When Charlotte became aware of this state of affairs she decided to make use of her contacts, suspecting that the “old timers” at LITS would not be able to resist! Right from the beginning, she made it clear that there was no money available, but that they really wanted this equipment to be operational again. John rose to the challenge, persuading several

skilled and knowledgeable colleagues to provide their time free of charge, and convincing Bill Orr of LITS to fund the necessary materials.

To be continued in Part 2 – the technical details.

References:

Faraday – a man of contradictions
IET E&T Magazine 12 Dec 2011
F L James/C Evans-Pugh

Guides to the Royal Institution of Great Britain 2
HJV Tyrell

www.rigb.org/our-history

Pat Gordon BSc(Eng) CEng MIET AKC

Pat is a Chartered Engineer with more than 30 years experience in the industry. Starting with Otis in London, she worked in construction, modernisation and engineering support roles. She has also worked as a Lift Consultant with Hilson Moran, and a Training Advisor/Assessor with LITS. Pat is now owner and MD of Optimum Lift Services, and can be contacted on patgordon@optimumliftservices.co.uk

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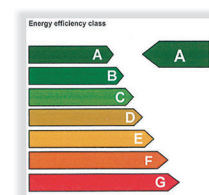


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Royal Institution Lantern Lift – Part 2

By Pat Gordon, Optimum Lift Services



This is the second part of the story – the technical details - about returning the “Lantern Lift” at the Royal Institution of Great Britain, back into service. The project began back in February 2012, when Charlotte New, Curator of Collection at the Royal Institution, Albermarle Street, phoned John Nichols, Training Advisor at LITS, to ask for help with the “Lantern Lift”, originally installed by Waygood Otis, which had been out of action for some time.

The ceiling of the Lecture Theatre has a circular opening at its centre, above which is the “lantern”. The lantern itself is an octagonal structure on the roof of the lecture theatre, with windows to the lower section and brick built walls to the upper section. A wooden floor separates the two, and the machinery for the “Lantern Lift” is housed in the upper half. The cupola or dome is in the lower section, mounted in a frame which can move up and down rails to allow natural light (and, once upon a time, fresh air) into the lecture theatre below. In recent years, steelwork has been installed across the opening to support equipment used for demonstrations and experiments during lectures. The main reason for raising the dome now is to allow access to the steelwork to install apparatus.



The ceiling of the Lecture Theatre has a circular opening at its centre, above which is the “lantern”.

The original lifting machinery and control equipment is of Waygood Otis manufacture. A single speed AC motor, with gearbox and drum, and a 1SOS control panel. (1 SOS translates to: Switches, three-phase power supply, squirrel cage motor, car switch) The installation dates from 1930, when the lecture theatre was rebuilt following an explosion in a nearby substation at the end of 1927. In the Waygood Otis correspondence confirming handover dated 31 December 1930 it is described as:

ONE ELECTRIC DRUM WINDING MACHINE

FOR RAISING AND LOWERING DOME

ROYAL INSTITUTION, ALBERMARLE STREET

Further old paperwork suggests that the dome itself was manufactured by Frederick Braby & Co, (purveyors of Zinc & Copper Roofing, Structural Steelwork and “Drop Dry” Glazing) to be carried in “a frame constructed on the lines shown in Messrs Waygood Otis’ drawing”.

In 2012, the Lantern Lift was inoperative, as the electrical supply was disconnected and the operational controls had been removed from the lecture theatre during refurbishment works in 2006 - 2008.

Initial inspection of the installation and equipment posed several questions, not least whether the machine would run if power was restored!

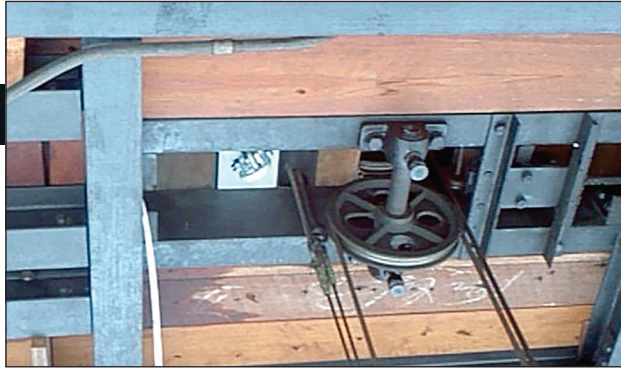
Firstly, arrangements were made for an insurance inspection, to determine what actions were needed to ensure the equipment met safety standards when reinstated, and secondly, a power supply was run to the machine room.

The insurance report made recommendations relating to inspection of the major components, lighting in the machine room, and guarding of machinery. This was all expected. It also said that there should be a safe means to lock the dome in the raised position before carrying out work below.

Several visits to site followed, and various meetings and discussions held with interested parties. A search for contract drawings began, and overalls were donned to clean the machine room and the equipment.

As previously mentioned, the machine is a single speed AC motor, with gearbox and drum, and a simple, three-phase power supply, car switch controller. The machine and controller are physically connected by a chain, which drives a mechanical selector. The chain runs from a sprocket on the end of the drum shaft, to a sprocket mounted on the controller, at one end of a rotating shaft – slowing and stopping of the machine is done via contacts mounted on selector arms fixed to this shaft.

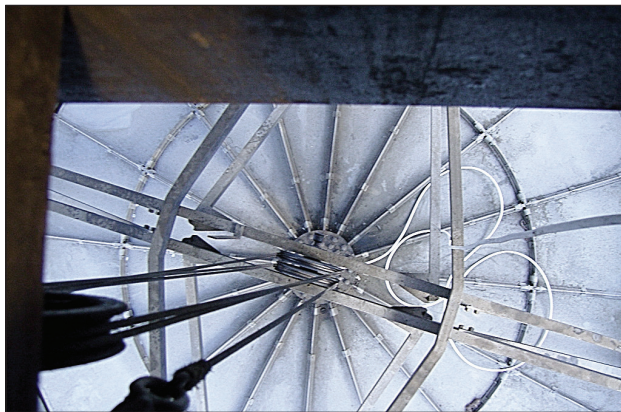
Royal Institution Lantern Lift – Part 2



The Roping Arrangement.

The roping arrangement is 4:1, with two ropes leaving the winding drum horizontally, passing over a diverter sheave down to a multiplying pulley on the frame of the dome, back up to a second multiplying pulley mounted below the diverter, down to a third multiplying pulley on the frame and back up to a dead end hitch between the machine support steels.

The dome itself sits in a steel frame with four guide shoes, which move vertically on four tee guides mounted in the lower section of the lantern.



The dome itself sits in a steel frame.

The lower section has windows – metal framed – which open. These are electrically interlocked to prevent the dome moving if a window is open. (This is a modification, which has clearly been done since original installation, but there were no records to indicate when!)

The initial plan was to get power up to the machine room, install lighting and then work on the machine and controller to determine what remedial work, rewiring etc. was needed. The aim was to reinstate as much of the existing equipment as possible, and to keep the installation close to the original 1930 design.

Sketches of guarding for equipment were produced, a Top of Car Inspection box was obtained to use for (temporary) control, materials were listed and the project was underway.



The Machine Room Isolator.

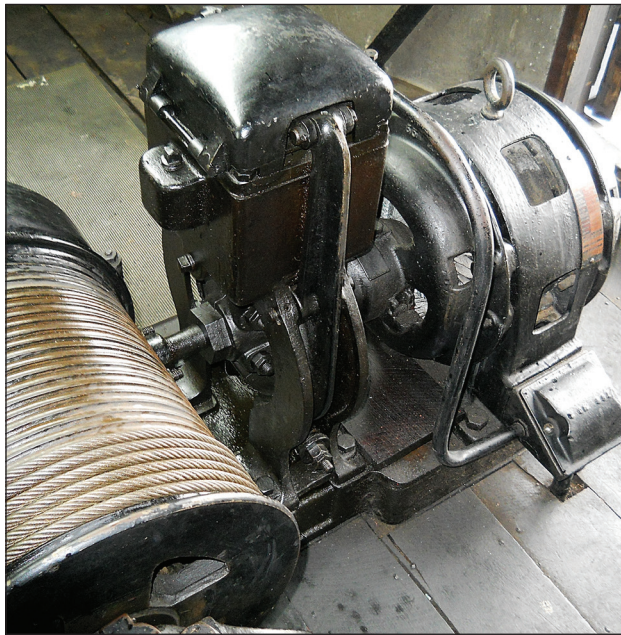
The most vital part of the project was to get an electrical supply back to the machine – we were assisted in this by Peter Nichols, John's brother, and their friend Doug Headland of EDR Electrical, in Orpington,. Both Peter and Doug are Electrical Engineers and, like others involved in the project, provided their time free of charge. Doug also donated most of the electrical materials, and, with his son Rion, installed the main supply to the lantern lift; put in two new lockable isolators, one in the machine room, directly replacing the previous main switch, and another in a plant room on the roof of the building, close by the lantern structure; fitted permanent lighting and switches; tubed & wired from plant room to machine room, and from machine room to the control unit in the theatre, a considerable contribution.



The Plant Room Isolator.

The machine was cleaned thoroughly and connections checked. Ellison oil was obtained for the oil immersed brake. (Not so easy to obtain as it is not commonly used any more!). Gearbox oil was replenished. With ropes removed from the driving drum, power was supplied to the motor – to our great delight (and relief) it turned!

Royal Institution Lantern Lift – Part 2



The Clean Machine.

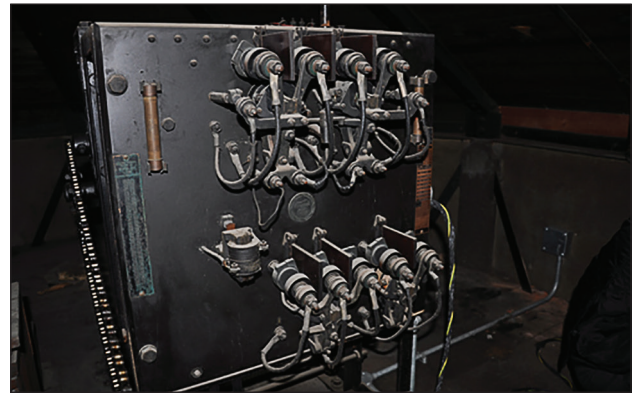
Ropes were cleaned and inspected to ensure they were within acceptable limits of wear (rope labels on site indicated 2 “new” 8mm ropes, length 37m had been installed but no date). Inspection of ropes was done using industry standard discard criteria: there was no sign of abraided red particles (rouging); the rope diameter had not reduced significantly (all measurements were well within 4%); and there were no visible wire breaks. However, somehow the ropes had been crossed, so this was corrected.

The frame of the dome was cleaned, and guide shoes cleaned and greased. All guides were cleaned. Several bag loads of dust were removed from the top of the dome.

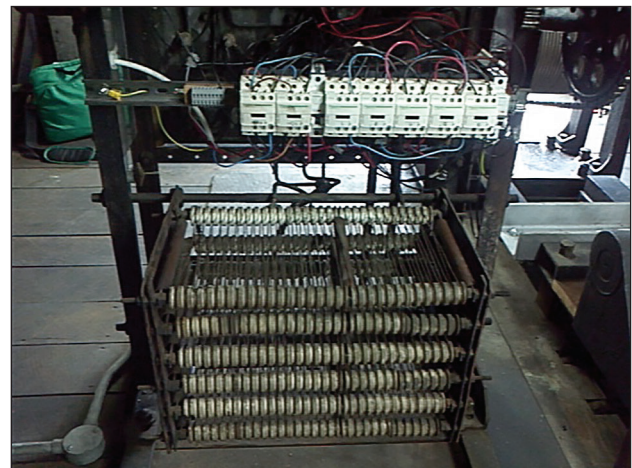
Inevitably, there were changes to the plan as the project progressed. It proved very difficult to obtain the correct wiring diagram for the controller – after several unsuccessful attempts, a generic diagram for 1 SOS was found by Mike Lyons, via an old colleague in the US, and it was modified to add the safety features (stop buttons and interlocks) and reflect the new controls. Rewiring and modification was done as necessary.

The chain connecting the machine to the controller was cleaned and replaced onto the sprocket; the machine was electrically connected to the controller and, with a deep breath, it was punched up – the motor turned and the dome moved up under power for the first time in several years! This was in July 2014.

And then the old Up and Down switches failed, as the coils were breaking down, and further modifications to the circuits were necessary, so a replacement controller was produced, fitting at the rear of the original controller framework. The existing contactors have been disabled but left in situ, so the installation looks the same as before.

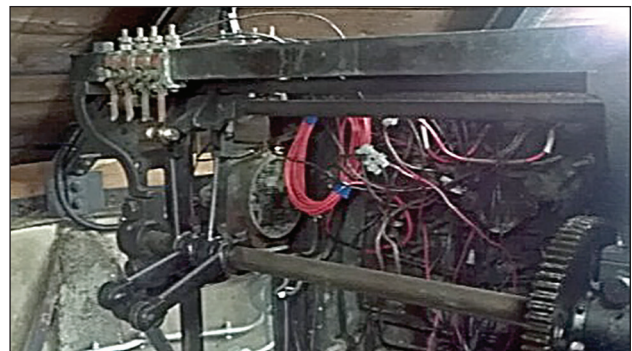


The Original Contacts.



The New Controller.

The travel of the dome is limited by the original selector. There is an Up stop contact and a Down stop contact. There are also final limits, which will operate if the dome overruns at either end of the travel, and a slack rope switch, which will operate if the dome “lands” on the ledge of the opening in the ceiling of the Lecture Theatre.



The Original Selector.

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The Plant Room Isolator.

A control box was fitted in the Lecture Theatre, beneath the control desk as requested by the Royal Institution. Connections were made from the Theatre to the controller in the machine room and the operation was tested – the dome raised when the

UP and Common buttons were pressed, and lowered when the DOWN and Common buttons were pressed!

However, the position of the control box proved to be a bit inconvenient for the Ri technicians, who asked for a control near to the dome itself, so a pendant control was installed and sited by the door of the machine room.

There is a safe system of work for using this control, which ensures no-one is in the room when the equipment operates. The Ri technicians have been trained to use the safe system of work.



The Original Contacts.

After consultation with the insurance inspector, it was agreed that the machine room itself is the safe enclosure for the machinery, so no further guarding was needed. A chain has been fitted across the doorway.

To provide a safe method of securing the dome in the raised position, a purpose made 2ton sling has been installed, mounted on a vertical aluminium angle on the frame of the dome, with one end permanently fixed to an eyebolt on the frame and a hook (painted red) on the other end which can be connected to an eyebolt fixed to parallel flange channel across the machine support channels.



Machine Room Access.



Sling on the frame of the Dome.



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The hook on the sling can be connected to an eyebolt fixed to parallel flange channel across the machine support channels.

Wiring diagrams have been provided on site, notices are in the machine room and the Lantern Lift is running again! The personnel at the Royal Institution are really pleased to have the Lantern Lift back in service, and the team involved in the project has a sense of satisfaction in a job well done. It is an example of an unusual application for lifting equipment and hopefully will remain in service for many years.

The Team:

John Nichols	LITS Training Advisor, (ex-Otis)
Mike Lyons	Lift Consultant (ex-Otis)
Peter Nichols	Electrical Engineer
Doug Headland	EDR Electrical
Rion Headland	EDR Electrical
Pat Gordon	Optimum Lift Services, (ex-Otis)
Bill Orr	LITS – Financial backing!

References:

www.rigb.org/our-history

Pat Gordon BSc(Eng) CEng MIET AKC

Pat is a Chartered Engineer with more than 30 years experience in the industry. Starting with Otis in London, she worked in construction, modernisation and engineering support roles. She has also worked as a Lift Consultant with Hilson Moran, and a Training Advisor/Assessor with LITS. Pat is now owner and MD of Optimum Lift Services, and can be contacted on patgordon@optimumliftservices.co.uk

Royal Institution The next challenge!

The Royal Institution also has a lovely old passenger lift, in a stairwell with decorative mesh panels making the well enclosure. It has round guides, a wood paneled car, and a Waygood Otis “Main and Micro” machine. Several changes and upgrades have been made to the lift since original installation in 1929, but it remains quite close to the original specification. Sadly, it is out of service.

As previously mentioned, the Institution does not have any funds to spare for refurbishment of this lift. (Vertical transportation needs in the building are provided by a very modern observation lift installed by Thyssenkrupp, and a passenger lift tucked away in the back of the building, installed by Kone some time ago. Maintenance is done by Schindler at present.) In fact, the Institution has recently sold some valuable paintings by auction to raise money.

We (the team involved with the Lantern Lift project) would dearly love to get the passenger lift back into service, refurbished to look as close to the original as possible. It probably needs a new machine and new controller, to ensure serviceability in the future, but for the lift car and the well equipment, we would like to see “old” parts used as far as possible. For example the landing doors, which are now manual single hinge wooden doors with vision panels. The original specification was for “double hinged doors” on the main floor, and “double sliding gates” on the other floors - and all lock handles were to be solid bronze finish! It may not be possible to get exact replication now, but we know there have been other lifts of this age that have been refurbished sympathetically.

What is needed now is some help. We need suggestions, parts, advice, expertise, manpower..... and also money! If anyone is able to offer help, please contact either John Nichols – 07554 062730, nicholslodge@btpopenworld.com, or Pat Gordon – 07725 946638, patgordon@optimumliftservices.co.uk. We think this could be a worthwhile project for final year apprentices, if anyone is willing to join in with the project?

*P Gordon
January 2016*



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The Royal Institution Passenger Lift - New life for an old lift - Part 1

By Derek Smith

This first of four articles explains the repair of an old lift in London UK.

To help readers understand why we feel the lift is worth repairing, I must first explain a little about the Royal Institution itself.

In the heart of London sits the Royal Institution, founded in 1799. Its foundation was to introduce new technologies and teach science to the public through lectures and demonstrations, a role it continues to this day. Through the years, many famous scientists have worked and lectured at the R.I. and made significant contributions to science, and to society. These include, Humphrey Davy, who isolated sodium and potassium, discovered calcium, magnesium, barium and bismuth. He worked with Michael Faraday on the development of the miner's lamp. Michael Faraday discovered electro-magnetic rotation, the start of the first electric motor. Liquefied gases, for the first time isolated and identified benzene, and many other great scientific achievements. Einstein had two pictures in his office one of Isaac Newton and the other of Michael Faraday, whose workshop is still in the basement of the Royal Institution.

Therefore, as you can see the R.I. has been at the forefront of science for many years.

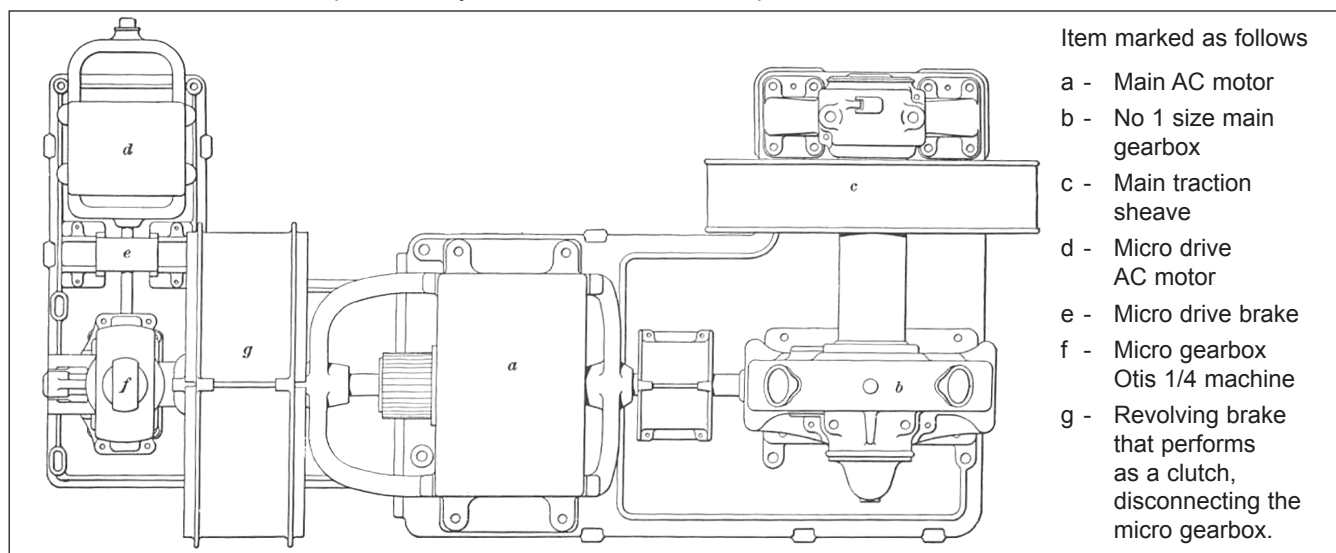
The history of the micro drive lift development is interesting - in 1915 the US Navy asked Otis and the University of Michigan to work together to solve a problem for them. The US Navy had a fleet of mine laying vessels. Being highly explosive the mines were stored below deck, presumably in some form

of magazine. To lay mines and avoid submarines, the navy was required to lay the mines whilst the vessel was traveling at a speed of around 15 to 20 knots. 15 knots being a typical surface speed for U-boats in 1915. What was required, was a lift to raise the mines quickly to deck level, when required. This would negate the old unsafe and dangerous practice of keeping the mines on deck ready for deployment. The Navy did not want to train crew in how to use the lift, it had to be simple to operate, just requiring the touch of a button. This was a novel idea; fully automatic lifts did not exist in those days. You required a lift driver to run the lift and stop it level. The solution was the Otis micro system. The system was trialed by the Navy and as a result an order placed to install such lifts on the entire mine laying fleet. When war finished Otis was still holding a patent for the design and started to sell the system mainly on goods lifts.

The R.I. purchased their lift in 1929 and paid an additional £246 to have the micro drive presumably they wanted to have the latest thing. £246 does not sound much these days but remember they only paid just over £1000 for the entire lift.

This appears a good point, at which to describe the micro drive operation, for those readers that have never seen one.

Below is a drawing looking from above the machine showing a micro drive machine with DC motor. The RI lift has an AC motor due to its low speed of 150rpm.



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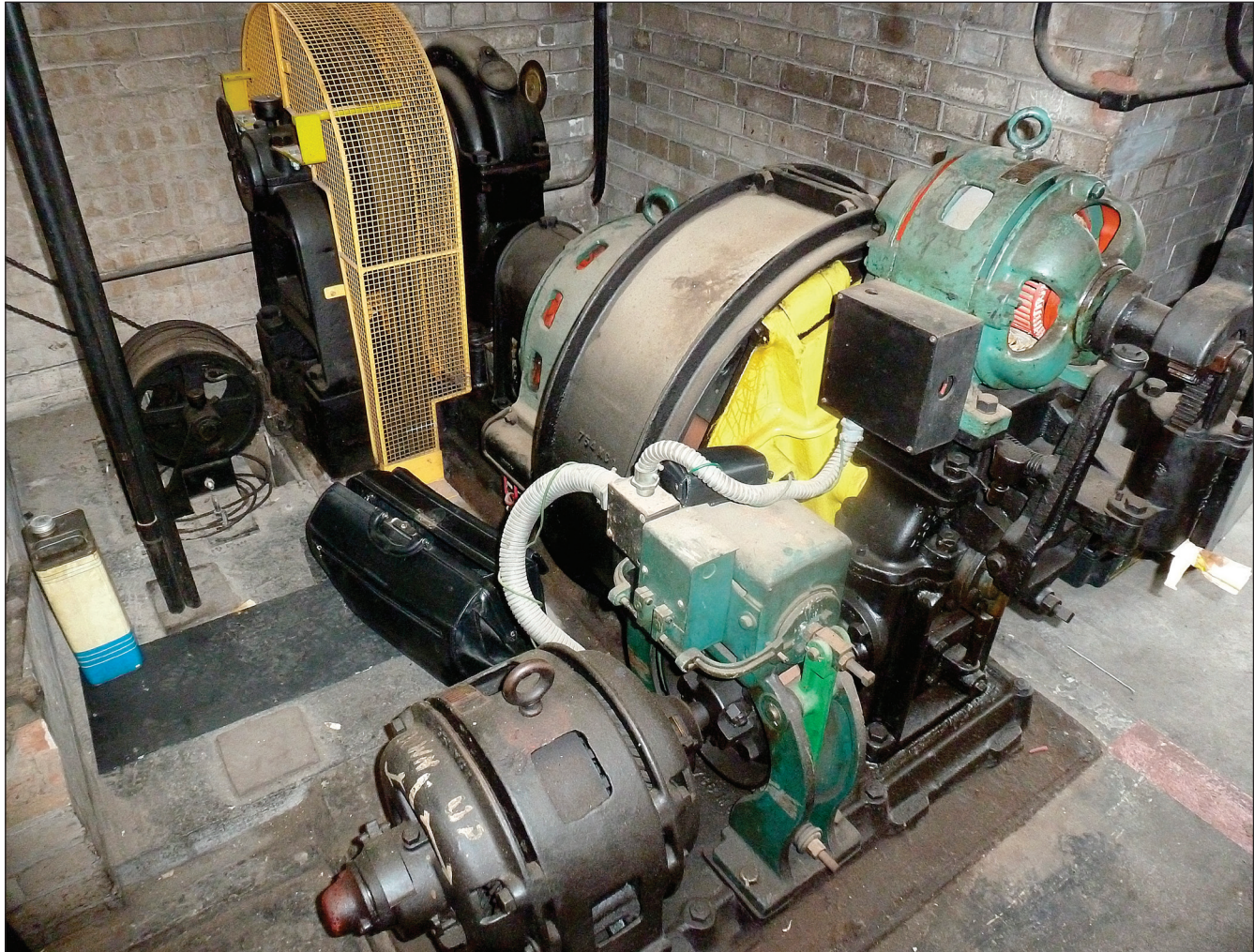
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Royal Institution Passenger Lift – Part 1



Micro machine after removal of rubbish.

When lift service is required, the controller sends power to the main motor and at the same time, the large revolving brake marked (g) in the diagram, lifts to disconnect the main gearbox (b) from the micro gear (f). The main gearbox then drives the traction sheave in the conventional manner. On arrival close to the required floor, power is disconnected from the main motor and the large brake is applied. This connects the micro gear back to the main gearbox (g), the micro gearbox motor (d), is then energized and the lift moves very slowly to floor level. Parabolic cams, located at each floor, determine the actual level. On arrival at floor level, power disconnects from the micro motor (d) and its brake (f) is applied.

Therefore, you now can see it does not involve a microprocessor just a pair of gearboxes, one of which provides a very low speed drive.

A rather complicated solution to a problem but it works, and works very well.

John Nichols had come across the old lift whilst working on another unusual Lantern Lift at the top of the main auditorium roof.

John decided this old passenger lift was an interesting example of lift engineering and architecture, situated in this prestigious listed building with exceptional connection's to early work on electricity, and called the home of Science in the UK.

John discussed with Clare Gardner (Director of Operations at the Royal Institution) the possibilities of restoring it as far as possible, back to its original state. The design was unusual by today's standards and very few indeed if any, micro machines exist in the UK, although a few do still exist in the US.

The lift had not been working for many years, and was in a sorry state. John decided to gather a team of other knowledgeable lift people he knew, the purpose being to see if it was possible to renovate

Royal Institution Passenger Lift – Part 1

the lift, and then return it to limited service at minimal cost to the Royal Institution, which is a charity.

Accordingly, in March 2016 John Nicholls (ex Otis), David Jackson (Jackson Lift Group), Derek Smith (ex Otis), plus two other experts Andrew Roberts and Jim Mc Vittie (both ex Otis) held a meeting and carried out a visual inspection of the old Otis lift.

The inspection was limited to visual inspection of the machine room, well enclosure, landings doors and car top. It was not possible to move the lift under power due to a problem with the electrical supply.

The equipment was very dirty, and there was a lot of rubbish left in the machine room by building contractors; none the less it was possible to determine that the hoisting machine was in good condition with minimal wear as far as we could ascertain. The car top and pit were filthy although the car top did have inspection controls, the operation of which could not be tested.

The original controller was still in place, although most of its contactors had been removed, its wiring having been rerouted to the modern relay control panel.

A rope driven floor setter was also retained but was not working due to the fact that its drive rope was broken.

The mesh well enclosure was of the perforated type and generally, in good condition. It would in time, require cleaning and the reduction in size of one or two gaps to make it safe.

At the end of the inspection, the lift team and members of staff from the Royal Institution sat down to coffee to discuss their findings and determine the next steps if any.

It was agreed by all that this rare and unusual lift project should begin!

The lift required a great deal of work, yet still appeared fundamentally sound and not in need of any major costly repair, other than new ropes.

David Jackson agreed that Jackson Lifts would re-rope the lift at their expense. John and Derek agreed to work to get the lift moving on inspection control, to permit a more detailed inspection of the machine and well.

The Institution agreed to the proposals and to assist in any way they could.

One of the first tasks being to gather technical data for the lift as follows.

Technical Data

Machine No	902228
Date of manufacture	1929
Original price to customer	£1004.00 installed and tested.
Load	1000 lbs 454kg (6 passengers)
Speed	150 fpm (0.762m/s)
Travel approximately	41 ft (12.5M)
Floors served	5
Stops	5
Openings	5
Machine	Otis 2 speed AC with micro levelling.
Controller	Otis 1-SOB (Single automatic push button).
Landing doors	Single hinged wood with vision panel and Yale closer.
Landing door locking	Otis L and LW locks with retiring cam.
Car enclosure	Polished solid mahogany inside and out.
Car gate	Collapsible mid bar gate with Otis 30-S gate operator
Well enclosure	Architectural steel with some ornamentation.
Guides	Round steel.
Safety gear	Otis broken rope with snail cam.
Car buttons and fixtures -	Not original having been replaced in the 1960s or 70s with more modern Otis fixtures

Work started on 23 March 2016 by removing rubbish from the machine room.

In further articles, progress will be reported until we achieve a final handover of this remarkable lift back into service for The Royal Institution. [E](#)

The Royal Institution Passenger Lift -

New life for an old lift - Part 2

By John Nichols

In the first article on this subject, published in Issue 91, it was explained why it had been decided to try to get the old lift working again, and a bit of its history. The following explains what has been going on since the work started in earnest.

Around ten or eleven years ago, several lift companies had been approached for help or advice. Unfortunately, despite the great history, and provenance of the building, the only suggestions apparently were to pull it out, and install a new one, or carry out a costly modernisation, both of which would necessitate removal or covering of the nice architectural surround.

However, because the lift is integral to the building, and as the building is listed, it would need "listed building consent" to remove it.

Rather than leave this rare example of Otis 'Micro Drive' (a fully automatic self-levelling system, accepted in its day as a fundamental advance in elevator technology), I decided that we would try to get it working instead of leaving it to die. I was of course very pleased when my old friend Derek Smith agreed to join me in this endeavour; I could not wish for a more able, well informed 'work mate'; and there would certainly be a lot of 'work'!

Some Dirty Work in the Machine Room

We knew this project was going to be hard going from the start, because when Derek and I first started visiting site it was always a 'physical fight' just to get in to the motor room! This necessitated a great deal of shoulder barging, and kicking at a very heavy warped teak door, that was thoroughly determined not to be opened. Accordingly, this swine was taken off its hinges; some wood cut off its bottom and then re-hung, and now swings nicely, when requested!

The machine room was indeed very dirty with a virtually black ceiling and walls. These were washed down and given multiple coats of white emulsion. The floor was degreased, holes filled in, brickwork to the controller plinth repaired, then finished with grey floor paint.

Windows cleaned, frames painted. Machine cleaned, machine room earthing completed, extra bulkhead lights and switching provided.

A new hand winding wheel was acquired (as an original winding ratchet was still there) along with an 11 D brake release lever. New hand winding

instructions provided, and mounted on the original tool board along with electric shock notices. We have retained the original winding instructions out of interest. They were originally framed with a hardwood polished frame, the instructions being kept clean by glass. How times change!

We were now ready to "switch on" and hopefully get the machine operating on inspection, however the main switch still had asbestos fuse protection, which needed to be removed by the Royal Institution.

Following its removal, Derek with very little assistance from me rigged up some temporary up and down buttons so we could move the car, to allow access to the top of car inspection box. With a small amount



Old ratchet machine winding handle.



We also included a LOTO device and the bespoke door release key, as pictured above, with white label attached.

Royal Institution Passenger Lift – Part 2



Painted décor at back of shaft, which was very dark, much improves the appearance of the ground floor entrance.

of effort it was made to work. This enabled us to start work in the shaft. We needed some light so we installed some temporary lights at the top and bottom. The original lighting supply had been removed during some building work; the electrician probably had a black and red wire left over, with no way of knowing what they should feed. Someone at some time would inform them, an item was not in service, and the problem would be solved. This never happened, because the lift was not in service. We installed a new supply in accordance with the new wiring regulations, although we have yet to get it fully tested and certified by an electrician.

And Some Filthy works in the Shaft

The car and shaft, it is thought, has never been cleaned down since 1926; the backs of the guides, car sides, and counterweight had a “thick black fur coat” of dirt, dust, grease and lint build-up, over many years, this coating was about an inch thick!

A new entrance, floor cill, architrave, and door had been fitted in the basement many years ago, so apart from dirt and grease, there was lots of builders’ rubble in the pit, and remains of the broken floor setter (selector) rope. Suffice to say, we leave it to your imagination, the only thing of interest found in the pit was a US five cent piece!

The ground floor itself, had been raised way back in time, however the inside of the shaft had been left, so the ledge was ramped down with sand and cement render to finish the job inside. I believe Derek proposed, and it was agreed (as if we did not have enough to do), that it would be nice to paint, all the dirty brownish floor beams, stair risers, and walls at the top and the bottom of shaft. So these were all given a coat of masonry paint, to match as close as possible the current decoration of the stairwell surrounding the shaft. It certainly improved the general appearance.

All of this aesthetic work is easy to say, although it took a long time. Derek and I usually work one day a week, on a regular basis, adding a few days here and there, when possible.

Putting some Things Right

A top of car inspection unit had been fitted at some point and was located in a very poor and dangerous position, almost down on the car roof, because, supposedly, it was easier to do and near to existing conduit boxes!

We repositioned it to a much safer position above the crown bar, but only after some very careful measuring, as the overruns on this lift are very tight.



Repositioned top of car inspection box.

Royal Institution Passenger Lift – Part 2

There was much evidence to show the L and LW door locks had obviously caused many problems over the years. With conduit tees, elbow covers and screws missing everywhere; insulators and contacts in the locks broken or damaged; all of course not easily available these days. There was no door release key! Years ago a screwdriver was commonly used on these types of locks, so Derek made one and it works very well.

If you have worked on, or know of this type of locking system, you will understand they are quite complicated and very difficult to work on at the best of times. (By the bye, if any reader has access to some Otis L and LW locks or parts and would like to donate them we would be very grateful).

Fortunately for us, there is a laser cutting machine in the so called Prep room of the Royal Institution that cuts sheet plastic materials with incredible precision, so we were able to get many of the insulator's made for us by Natasha (the 2016 Christmas Lectures Assistant). We made many of the various missing conduit covers ourselves. There were some additional problems of black wires strangely turning red and vice versa between locks!

Gone are the days when circuits are installed with the minimum number of connections possible, now people think it is fine to lengthen wire with inline crimp connectors, and any colour you have to hand. It's a pity people don't invest in a good quality crimping tool, and use multi strand wire to do the job properly.

The correction of these lock problems, and earthing pushes, was long and hard fought and the cause of much cursing.

The car gate had been damaged and bent, having only one roller and the bottom brass track pickets were very badly worn.

We removed the gate along with the top track in the basement to enable repairs to take place. The bottom picket rivets were removed to release them. Because there are no brass pickets of the correct size these days (as far as we could ascertain), they would have to have new track sections brazed on and then machined down to suit. A supplier of the correct sized top rollers was tracked down although they were not of the same design, suitable spindles could be made to match. So with some more work we hope to replace the gate shortly.



New ropes stored in motor room, ready for installation.

As previously stated by Derek, The Royal Institution is a charity; so monies are in short supply and for that reason, we were very pleased to receive a substantial donation from L.I.T.S. that has met nearly all of various material costs to date.

The next and biggest single job is replacing the main ropes, selector rope and safety rope. The provision and installation of these have been generously donated by The Jackson Lift Group, in the person of David Jackson. His team, I am pleased to say will include some apprentices, who not only will have an interesting job to include in their NVQ portfolio, but will also have experienced working on a very rare machine, installed within what is called 'The Home of Science'.

In a few weeks, with the installation of new ropes, we plan to have our first high speed run; this will start a new chapter in our project and may well reveal some new challenges for us.■

The Royal Institution Passenger Lift – New Life for an old lift-Part 3

By John Nichols

The Waygood Otis tender was submitted on the 8th May 1929 and the equipment manufactured in 1929. Although there is no hand over date, it would be safe to assume it would have been installed late 1929/30. It ran satisfactorily for 69 years until 1998, when a new controller was fitted, presumably because spares were either not readily available or too costly. The lift continued in normal service until January 2008. In order to assist with a modernisation program that created a central atrium created in the Ri, the lift was put on builders service, this seems to have been the cause of a lot of damage to the car interior; they utilized the motor room for their stores/ office area!

The very last call, recorded in the log card of this aged and venerable machine (after a total of 79 years in service) stated: "Selector rope eyebolt snapped" 06/04/08. It was never repaired, and the machine had been left stationary ever since. When we were clearing up in the motor room, the remaining tangle of one of the two selector ropes was removed. Strangely, we never found the eyebolt although the broken bottom section was still in place on the car top, with a nut above and below its mounting angle, a fatigue fracture being clearly visible.

There are two ropes required on this particular arrangement, as one rope winds off, the other winds on the drum. We disconnected the floor setter (selector) drive chain, cut the intact rope and temporarily coiled the remains under the car. How and why the eyebolt had broken, and the operation of the two selector ropes puzzled me for some time.

However it was obvious that the two selector ropes, and the broken rope safety rope, were the original ones, and had never been changed since installation. The evidence being, the broken rope safety rope had a knot that activated the safety snail cam device, with a spring hooked in a lay of the rope to keep it tensioned, which had been seized in with "spun yarn" that was also used to tidy up the spare rope terminations under the car.

A large twelve inch ball of "spun yarn" was always on the roping gangs Lorries, it was a lightly tarred, small rope, made of two strands used for seizing and general rigging, and tying jobs on board ships; it goes back hundreds of years I believe. It was commonly called "Ginger String" by the roping gangs I worked with as an apprentice; they were nearly all ex seamen in those days, for obvious reasons.



Before the ropes were to be fitted by the Jacksons Lift Group team, Derek and I discussed how the two selector ropes might be installed. The set up would be quite complicated; there was one continuous spiral groove on the drum, with a rope spooling at each end. We calculated at mid travel there could possibly be only one or two grooves left in the middle of the drum, which left very little margin for error.

There was also a two to one tensioning device between the underside of the car and the floor of the car. (The car floor had been hinged originally; as it would have had sprung loaded floor, which in those days allowed the car to move with the car gate open, when no one was in the car.)



Royal Institution Passenger Lift – Part 3

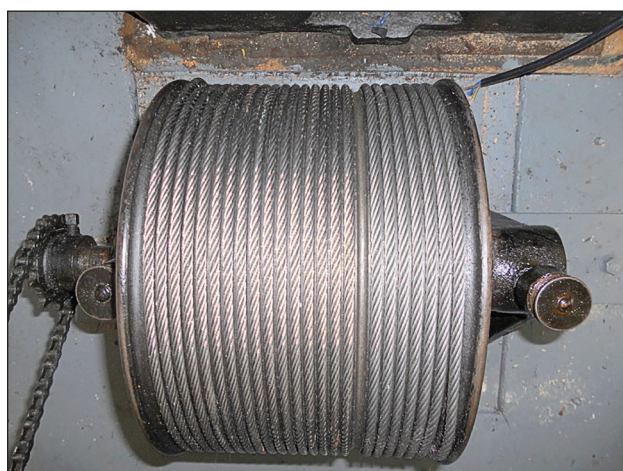
Installing the Selector Ropes

Due to the complexity of these two selector ropes, Derek and I decided we would install them ourselves! There was a lot of measuring, unwinding and rewinding of rope out on the roof, improvising a method of keeping tension on the one, already positioned rope, whilst winding on the other; needless to say the cutting of the last rope was not done without some, intrepidation.

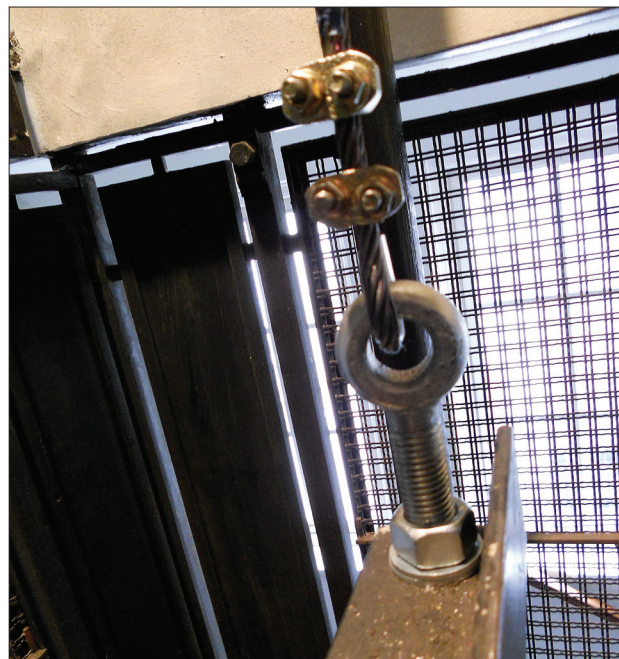
Very interestingly for me, the rope from drum to car top, traversed about 8 inches along the drum during a top to bottom journey of 48.5 feet; this is called fleet. This meant the original long eyebolt termination on the car top had suffered very gradual fatigue, being pulled slightly out of upright by a few degrees and then pulled back on return of lift to the top floor. My puzzle as to how the bolt broke was now solved!

After the 79 years of service, the eyebolt had finally given up, due to fatigue, which of course was the cause of the very last callout!

Feet angles are the maximum angles allowed on a drum where ropes are spooled left to right from the centre line of the drum, usually to a sheave some distance away, on some cranes for example. Not the same application as we had, with a fixed point on the car top. After considerable thought and work the two ropes were successfully installed, leaving only one groove free of rope, as it traverses the drum, which is intriguing to watch in action.



We also acquired and fitted a much shorter, and larger diameter eyebolt, which should last a very long time indeed, and will definitely not fail through fatigue (even with a fleet to contend with), which after all our efforts renovating this very rare machine, we both sincerely hope it does!



A Notable Day! Thursday 21st September 2017

We connected up the selector chain drive, to the selector rope drum, and after some checking, shorting out of the car gate switch, that was awaiting replacement, after some outstanding repairs were completed.

Derek thought we might just see what would happen if we put it on normal for the first time in 9 or so years. I had been longing to see the machine run on fast speed, and the main and micro levelling, since the very start of our project.

I was to switch on and stand by the stop switch; Derek was going to put a call in and when he did, she went away with a nice quiet run to the next floor down and levelled in perfectly." Seemingly to me, really strutting her stuff, and showing off to us, on her first normal run since her eyebolt failed, a good day for us to remember.

Main Ropes & Broken Rope, Safety Rope Installation

The most costly, and labour intensive task in the resurrection of our main micro machine was always going to be the provision of new ropes. They were donated for the project by Maurice Baldwin, Managing Director of Re-Ropes, who form part of the Gustav Wolf Group GmbH one of the leading manufacturers of Special Steel Wire elevator ropes. We are hoping when Dr E.J.Wolf, Group Managing Director comes to London he will visit the Ri.

Royal Institution Passenger Lift – Part 3

David Jackson had arranged to provide the installation team, slings, tackles; counter weight prop, and rigging equipment.

The plan for them to start on the hard work of the re rope was set for Tuesday 29th August as there was a break in the Ri lectures.

Charlotte New, the Curator of Collections, had arranged for the Ri photographer Paul Wilkinson to be in attendance, organised parking, and provided a lunch, for all those contributing to the passenger lift being re-roped.

To quote Michael Faraday, *"I have more confidence in the one that works mentally and bodily at a matter, than the six that merely talk about it"*

Derek and I arrived bright and early to meet the Jackson team, along with Kevin Lockwood, another old Otis colleague of ours now a L.I.T.S. Training Assessor.

Derek and I explained we had already fitted the selector ropes, so it was decided they would fit the broken rope safety rope, first. This alone was quite a difficult job, with very little space up the side of the car to tension the spring for the safety snail system, however made a little easier with the use of bulldog clips instead of a knot and seizing the spring in the lay of the rope, as it was originally achieved. Then after some checking of measurements, all the hoisting equipment and propping was positioned for the main ropes to be replaced. There was only one problem that had not been identified previously, the ropes clevis bolt terminations would have to be metallised in their cups with white metal. So gas bottle, blow torch, melting pot, and ladle were sent for. A hot work permit was quickly provided by the Ri - they quite frequently have controlled explosions/big flames, during the more exiting children's lectures.

Whilst the Jackson team, including the apprentices, were landing the weight and slinging the car in preparations for installing the main ropes, Kevin Lockwood (L.I.T.S. Training adviser for Jackson's apprentices) conducted some onsite observations for inclusion in their NVQ training Portfolio. He is seen (right) checking on how the tackle was to be slung to raise the car, after the counterweight had been landed at a suitable height, and observing a new rope being attached ready for pulling over.

The equipment to metal in the clevis bolts arrived and things really got underway.

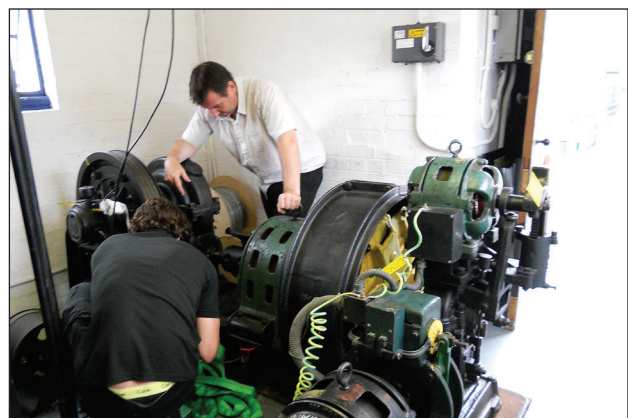
The old clevises were removed individually, cut off; the new rope attached to the old one, which was then used to pull each one over the sheave and diverter down to the counterweight. The white metal melted out, the clevis rope termination's made by Jack Sawyer, with some difficulty as the rope ends were very hard to double back into the cup, as I remember ropes seemed to be more malleable in those days .



© Paul Wilkinson



© Paul Wilkinson



Royal Institution Passenger Lift – Part 3

The Re-roping Team Photos



Royal Institution Passenger Lift – Part 3

Ropes re-metalled in and attached to the rope termination plate (biscuit), until they were all connected to the car top; old ropes removed and loaded for disposal. Then down to the first floor to cut the ropes to required length, make terminations, re metal, and connect back on the counterweight from the top of a ladder in the pit. All sounds very easy to write on paper, but a lot of work. Of course this process is rarely performed these days as nearly all rope terminations in Europe are now of the wedge variety. Derek and I are very grateful to the contributions the Jacksons team have made to the renovation of this fine example of lift engineering history. Thank you all very much indeed.



© Paul Wilkinson

A Car Buffer Surprise

On our next visit we re-checked the overruns, as we knew they were very tight. Indeed there had been two oak packing blocks, one of which was under the existing counterweight buffer, and one left in the pit to cover for any possible stretch issues in the past; the rag bolts holding down the buffer were 10 inches high.

First we landed the counterweight and there was only seven inches left over the door motor, which was the highest point on the car, so it was decided to put the remaining block under the counterweight buffer.



© Paul Wilkinson

Then we started to land the car with me watching the counterweight; Derek moved the machine down below the basement floor, I shouted out that clevises were getting very close to the Diverter and then even louder when they were almost touching! We stopped and went down to the basement and were amazed, when we saw the bottom of the operator through the vision panel and yet the car was not landed!



The car was moved up to access the pit and have another measure up, low and behold there was still quite a distance to go before the car would have buffered. We would have to get two 20 inch purpose made stools to correct the problem. Derek was convinced the final limit and buffers were never installed like this. However I called on Lift Specialists' Lomac Engineering, who I had dealt with for many years when I was working. They were good enough to make them for us. We put them in place and now had 9.5 inches to buffer the car, a flex guard added to one and then we landed the car. You can clearly see the rings marks left on the buffer plates following this exercise they are built into the car shoe and safety snail cam housing. The reason for this discrepancy was obvious really; the basement

Royal Institution Passenger Lift – Part 3



floor had been raised in the modernisation, of the basement. There is a modern door and architrave at that floor and a raised wooden floor cill that can be seen in the pictures below. The door lock and floor button had been moved and floor setter adjusted but the shortened overruns either forgotten, or ignored because it was too much trouble!



We had already fitted a chained ladder and hand rail in our nicely painted pit but now, would have to cut away the final limit bracketry attached to the back of the round guide on the left hand side and move it up to its new correct position



Derek was starting this unexpected task - I believe he may be there for some considerable time, if he doesn't wear a hard hat!

Because whilst he was moving the limit, I with great care I might add, screwed and fitted a 12 ply panel we had made to reinforce the car top, as some minor cracks had appeared in the car ceiling panels during the re rope operations



So that's exactly where we stand at present, pardon the pun.

As an aside, when I initially asked Ish Buckingham, could we produce some articles of general interest for Elevation about our project, he agreed. I also asked who might we best approach to promote and publicise the Royal Institution in Elevator World; Ish recommended we approach a Dr Lee Gray.

Accordingly in May, Charlotte New sent him an invite to visit the Ri from an architectural historical, and lift interest point of view, we did not hear for some considerable time.

Then in September he e-mailed Charlotte to say he was presenting at a CIBSE convention and would like to visit the Ri on the 18th September. He spent the morning there, and was very interested in the Building, the Museum, Archives, the Auditorium's Lantern Lift; and of course our renovation of the main micro machine. He took lots of pictures and discussed the lifts at length with Derek and myself. So we are very hopeful that he will at some point in time write an article in Elevator World, perhaps after we finish the project, and hand the machine over to the Ri, which we are planning to do in January in 2018. 

The Royal Institution Passenger Lift Approaching Resurrection?

"No one said it was going to be easy"

By John Nichols

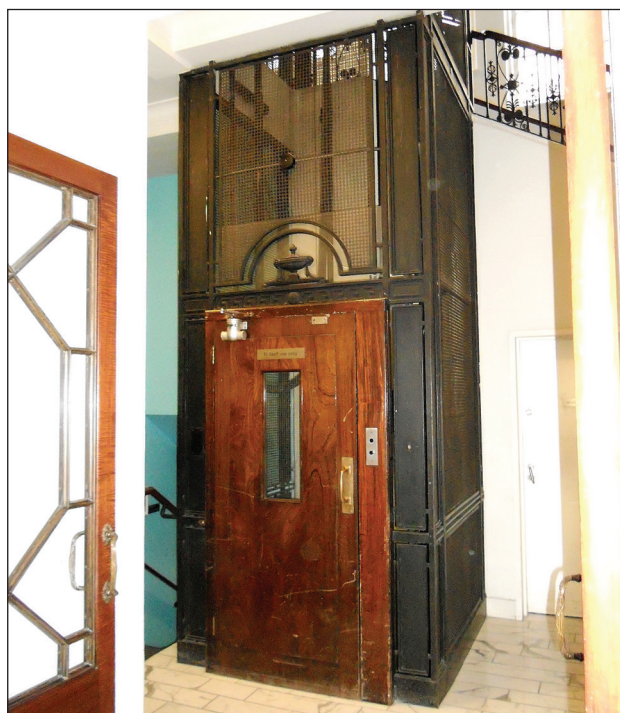
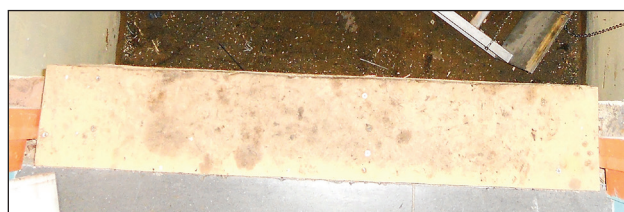
Since our last progress report, Derek and I have spent a considerable amount of time in the basement. It was here we had stored the heavy mid-bar gate and top track, out of the way for some months, now to renovate and replace it. We had managed to acquire some suitable replacement rollers and brazed new feet on the worn out pickets, we straightened out and reinforced the leading vertical bars, made two improvised heavy steel dollies for the riveting required for their replacement. The gate was put back in working order ready for replacing on the car. This was not achieved without a considerable struggle! Mainly because Derek was using the old, "I can't help, I've had a heart attack excuse"

As those that have worked on mid-bar gates will know, not only are they heavy, they have a "particularly very nasty habit" if they are not trussed up, of suddenly opening themselves up like a concertina when moved in any way, and they really hate to be hung from the top track, and do everything in their power to prevent any sort of permanent attachment!!

And it was also in the basement, during a modernisation about ten years, ago that the builder had installed a new entrance (shoved into place would have been a better description). Maybe they knew the lift would not be used when the new one was completed, so did the least possible to keep it on builders service?

There was a false dry lining wall created in front of the existing wall, which then left the door sitting in a recess, instead of being flush to the front as all the existing doors. (As a consequence they could not fit a door closer like the existing ones, therefore did not bother to fit one!)

However, this had left another recess all round the doorframe on the shaft side. The door frame sat on a cill made from a piece of particle board, packed up pieces of wood and plastic from the original old cill level to match the new raised finished floor level.



This particle board had been toshed at an angle onto the door frame with one screw either side (tosh means rubbish) they never even bothered to give the door frame a undercoat just left it primed as it was delivered. A real pig's ear of a job!!

We decided to rectify the situation by removing the cill bodge up! We then made some shuttering and created a solid concrete cill with the top mix dyed and floated in to match as best we could to the black tiled floor. We packed the gaps either side of the door frame with timber and filled in over the top to the cill above with plasterboard, and painted it all to match



Royal Institution Passenger Lift – Part 4

the shaft. Finally, we fitted a chain door closer that Derek had acquired, it can be seen half way up in the door on the right hand side. By no means, the proverbial “silk purse,” but a thousand times better.

We made guarding for the floor setter chain, drum drive and utilised some thick clear plastic on site to create, a see-through guard for the back of the old original controller containing the floor setter, which was still being used.



The temporary lights have finally been made permanent with six bulkhead fittings down the shaft. We fitted blocking plates on the inside of the enclosure adjacent to the lock roller arms preventing any possible nuisance access, and also blocked, or closed up, any other gaps in the enclosure that might be considered a problem.



French polishers Joe and Dean of Yebra French Polishing Ltd, who had been contracted by the Ri to French polish the car and doors, started work. We had to program closely with them, moving the car when they required.

They gradually stripped the doors and car, sanding and rubbing down with steel wool to reveal the car was built from quartered mahogany, with small ebony edging to the panels, filling holes and making good damage. They made and fitted a frame that was missing from a vision panel and then applied several repetitive coats of shellac polish on to a final finish coat, quite a specialist skill and knowledge these days. Joe and Dean really did make the proverbial “silk purse out of a sow’s ear”.



Royal Institution Passenger Lift – Part 4



Bye the bye, shellac is a very old and fine polish made from a resin collected from the female lack bug. (Not a lot of people know that).

It lives in the forests of India & Thailand, collected and dried into flakes of many colours that are then dissolved in ethanol making liquid shellac. It was also used on all sorts of electrical equipment as it is a good insulator and keeps out moisture, it's the shiny covering seen on old coils and armature windings, probably most remembered as the stuff old 78rpm records were made from if you go back that far.

All the bronze meshwork and mahogany balustrade with wonderful ornamental cast iron posts' and finials down the staircase looked very dull now, in comparison with the shiny doors and architraves, it would have all been lacquered originally. So we did our best by cleaning it all down, brushing on and polishing off a coat of "beeswax polish" not as shiny as we would have liked but worked quite well and smelt nice for a week or so

Derek has done lots of homework during the project, but in particular did a fine job spraying various items that would have originally been bronze (a new load plate, car panel and push plates) to get as close as possible to looking aesthetically like the original fittings and they are very pleasing to look at.



On the ground and first floor doors, protective aluminium sheets had been fitted on the bottom section at sometime. This protection was also covering damage, but in turn had also been damaged and looked awful. After some consideration it was decided to replace them with a 9mm ply screwed panel and have them varnished when the French polishers were on site, which we did, a much better solution.

There was no diffuser for the car light and emergency light; from marks on the ceiling it would appear to have been a round one. We looked for a replacement diffuser but could not find one that looked suitable for our ancient car. So we decided to try to make one that would be better suited, and look the part, with the help of Tom the maintenance engineer who works at the Ri, who found and cut some opaque plastic for us.

I had acquired some aluminium moulding, which was cut to size "twenty by twenty inches", some cap head nuts, washers (which Derek then sprayed to match the push plate etc) then hung from the car ceiling on studding, covered with white plastic tubing, drilled some holes in the ceiling, then fitted it. Low and behold a nice "twenties" light unit, get it?

Royal Institution Passenger Lift – Part 4



Some Great Gear Work

Because of its weight, overall shape and large size of the complete machine, in my mind, I think it might have been assembled on site with gear men coming out from the factory to finalise the job. The ceiling and roof of the motor room are lightweight clay pot construction with tarmac on top with no sign of any lifting points. When I was an apprentice, gear men were always considered to have some separate skills, and we all spent around six designated months with them.



When taken in total, the main gear with its micro gear is a complicated “big bit of kit”.

We have now started the process of thoroughly checking the gears, brakes, bearings, draining and replacing oil etc. A major job as in effect you have two conjoined machines.

We needed some “physically big” spanners and had to resort to purchasing this weighty 18 inch fellow.



Then the precision tools, clock and feeler gauges, and engineers blue, from one extreme to the other. Not forgetting the precision hammer!



Royal Institution Passenger Lift – Part 4

I was particularly interested in the marine bearing, which I had never seen, Derek knew about them and the reason they were used.

I noticed the cast iron bearing covers had a decorated centrepiece, which had been painted over, and decided to clean them up. There was a bronze Wagood Otis Badge- on the back was the name W.O LEWIS (badges) Birmingham.



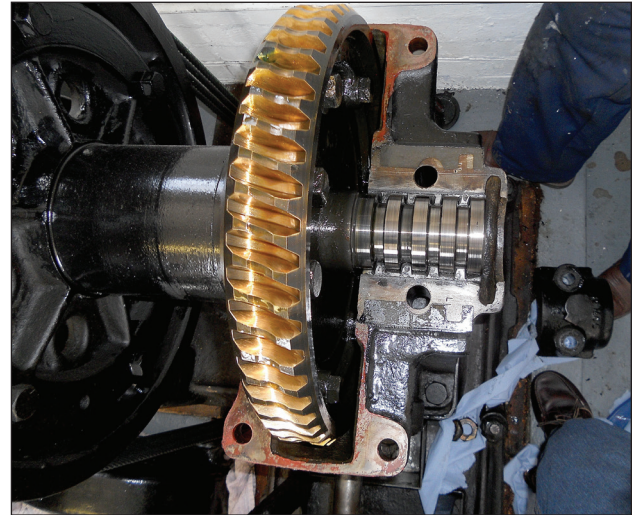
I looked them up on the internet out of interest and they are still in business! Goldsmiths and Jewellers & Military Badges, Birmingham Ltd established 1832, Wagood Otis must have been very proud of their machine to decorate it with two badges from such a prestigious company.

We have many pictures to show we did actually check everything required, I think this one really shows in one shot, the size, shape and complexity of the machine:

With the 9D brake on the left looking over the small crown wheel through the revolving main brake (clutch) cast iron guard, on to the main gear and driving sheave.

Over the next few weeks we plan to meet with the plant inspector who wishes to witness some load tests.

In the next issue we trust our long project to give her the kiss of life will result in her complete resurrection. Just some minor tarding up, then back to work approaching her 90th Birthday, to serve The Royal Institution the Home of Science as well as ever she did!



For Derek and I she's no tart, she is a real and very elegant Lady!

Go Well 





Charity Clay Shoot

Friday 7th September 2018

To be held at

West Kent Shooting School

New Hay Farm, Old Hay, (Off Pearsons Green Road), Brenchley Kent TN12 7DG

T: 01892 83 4306 E: info@westkentshooting.co.uk

westkentshooting.co.uk

A 70 Bird Sporting layout to include Clays & Cartridges

12.30pm Arrive for a Gourmet Burger and Homemade Coleslaw

1.30pm Commence shooting in squads over various sporting stands—Novices & Shooters welcome

4.00pm Raffle / Prize Giving and dispersal

£65
Per person

This is a pre-booked and pre-paid event

Please contact

James Edge james.edge@griffin-elevators.co.uk

T: 07736158910

Or call the Shooting School



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