Other memories of the steam age at Oxford New Theatre

Besides the stage lighting installation, the New Theatre Oxford included many curious installations and architectural features that are worth remembering. Here are some of them...

DC Power

Deep in the basement under the stage there was a small room in which stood a large steel enclosure, from which one could perceive crackling and buzzing noises, flickering light and a smell of ozone. The enclosure contained two huge glass bottles filled with mercury - perhaps half a gallon in each - electrodes close to the mercury, fed from a transformer, created an arc which transmitted rectified direct current (at about 120 volts if I recall). This unit fed DC power to the carbon arc followspots and cinema projectors. Once it had also powered arc lamps on the wing gantries each side of the stage, but these went out of fashion years ago. But in 1975, this system was still in operation.

The two original Strand Electric sunspot follow spots were installed in the original projection room high above the upper gallery. By the 1970's the original cinema projectors had been relocated from this room to a new projection booth at the rear of the dress circle, to enable the theatre to show wider screen images that would have been excessively keystoned from the original projection room.

It was adjacent to the projection room in the dress circle that I installed the new MMS memory lighting desk in 1975. One useful feature of these rooms was that they were accessible by a spiral staircase that ran from the main foyer, connecting to the bars at each level and both the dress circle and upper circle projection rooms. I assume that this was a fire escape, as it was built into a bay which projected outside the building into the alley in George Street and had windows (most of them broken and pigeon soiled) all the way up. So operators could easily access the bars and toilets during performances without walking through audience areas.

The carbon arc follow spots and projectors worked in much the same way. Two copper covered carbon rods were mounted axially in the lamphouse, with the rearmost rod projecting through a small hole in the reflector. One rod (the Anode if I recall correctly) was of a thicker diameter as it would burn faster than its counterpart. When the energised rods were touched together, tthey created a plasma arc (similar to an arc welder) - after ignition the rods were drawn slightly apart and the arc sustained. As the rods burnt, there was a mechaism to maintain the desired arc gap and its position at the focal point of the mirror - though this was only approximate - for both cinema projectionists and follow spot operators it was necessary to undertake continual manual adjustments of the arc gap and position to maintain a clear bright white light without too much noise and flicker. The rods needed replacing every 15-20 minutes, using asbestos insulated gloves. Just like in a welding shop, the arc lamps were fitted with flexible extraction hoses to vent the fumes out of the room.

Arc lights were invented by Humphrey Davy in the 1800's and were a great improvement on previous lanterns which burnt lime. Even after the advent of carbon arcs and xenon arc lamps, follow spots continued to be called "limes" and their light continued to be "limelight". Film studios - with more lax fire regulations than in theatres, continued to use carbon arc equipment well into the 1990's. (Certainly there was a functional DC power plant at Pinewood Studios when I worked there in 1981).

Carbon arc spots and projectors were considered too dangerous to be placed in direct contact with the auditorium - their light was projected through small glazed portholes, with similar portholes to allow the operators to observe their work. These portholes were usually equipped with their own safety curtains which were held up by a wire with a fusible lead link that would melt in the event of fire and ensure that the curtains dropped.

The sunspot follow spots were very heavy - hardly touring items - I would guess that they weighed in at over 300 kg each including the base/tripod. Strand Electric did not spare bronze or brass. But due to their weight when correctly balanced they were very easy to operate smoothly - far easier than their modern equivalents.

Follow spot operaters were isolated from the performance and relied on a show relay loudspeaker to hear the show. Their room did have an internal telephone, but cues were almost always given via cue lights.

I dont know if the carbon arc lamps at Oxford are still in use, though I suspect that the cinema projectors have long been replaced with digital equipment.

Emergency lighting

Another room in the basement housed wooden racks with rows of glass accumulators providing 120 volt DC power to a separate lighting system comprising exit signs and emergency lights at the end of the seat rows and general lights in all backstage and front of house areas. Cabling for this system ran in a totally separate conduit network throughout the building.

These batteries required continuous charging and in the event of a power cut, they could provide light for several hours. Regulations stipulated that the emergency lighting was switched on an hour before the performance and left on half an hour afterwards. A fireman's switch by the stage door could also turn the emergency lighting system on.

This system required regular maintanance - mostly topping up the battery acid and checking the specific gravity of the distilled water/acid mixture.

General lighting

I once made a list over every lighting fitting in the entire theatre, though I mislaid it many years ago. There were literally hundreds of light fittings, many using special architectural lamps to complement the art deco design (though I am not sure if these lamps are still in production).

Though barely discernable from the outside, the New Theatre was constructed using steel frames and reinforced concrete, with the interior shell supporting the art deco plasterwork that the audience could see. These structures included many concealed lighting coves, the lamps of which were difficult to clean and maintain and constantly subject to dust.

The architectural "piece de resistance" was the huge cove around the proscenium arch, about 15 metres high and 25 metres wide. Inside this cove was a continuous three compartment batten, with hundreds of 40 watt lamps. the three rows of compartments were covered by red, blue and green filter gels. High in the fly tower, beside the flymans room, there stood a "Holophane machine" - three massive resistance dimmers (much like the Grand Master dimmer modules) that were driven up and down by a mechanically programmed motor, thus cycling between various mixtures of the three primary colours. This system was provided by Holophane limited, a company which is still in operaton in the UK here in 2020.

Ouside the theatre we had neon lights and floodlights on the marquee - these also had to be maintained - a precarious task using very long ladders in a busy shopping street - definately a job for sunday mornings!

The size of the electrical crew was dictated as much by daily building maintenance as by the requirements of stage lighting. We made complete lamp checks every day - a task which usually required two or three men for up to four hours. Both backstage, on stage, front-of-house and exterior lighting had to be checked and this was inspected every day an hour before the performance by the duty manager.

Telephone system

The theatre was equipped with an internal telephone system with about 48 internal extensions - connecting the offices, bars, stage and technical areas, box-office and dressing rooms. This system was mains powered but reverted to power from the emergency lighting system in the event of a power failure. The exchange was in another room in the basement and was entirely electromechanical with relays and mechanical autoselectors for the dial telephones. This system ran almost flawlessly for over 40 years - with no software updates!

Sound system

When I arrived at Oxford in 1974, the sound system was primitive. Many touring shows, particularly rock concerts and musicals, brought their own gear and crew in, but for other productions such as plays and small concerts, the system was minimal.

It is laughable today, but in 1974 the sound system for this 1700 seater auditorium (which fortunately had excellent acoustics) was a six channel monophonic 200 watt Shure Vocal Master mixer, it had six gain control knobs, six reverb level knobs (one for each channel), a master gain knob and a reverb master knob - and no monitoring or headphones. To this we connected a collection of Shure Unidyne B mics and we also had a single STC 4033 ribbon mic (perhaps a relic from the variety shows of the 40's) Four speaker cabinets - two each side of the proscenium.

We also had a mono effects mixer - perhaps 50 watts - to which we could connect two old Garrard transcription turntables (for sound effects) and a single Ferrograph Series 5 or 7 reel-to-reel tape deck.

Perhaps the nicest audio toy was the mic riser - a microphone stand complete with mic, buried under a trapdoor centre stage, just upstage of the footlights. This could be elevated and lowered by motor as required. It was always amusing watching a DSM or ASM operating this from prompt corner to see if he or she would land the mic at the right height for the singer.

In 1975 the New Theatre Oxford invested in it's first true sound system - a 32 channel desk from Malcolm Hill with some serious speaker cabinets and amplifiers. (I still have small Hill mixer of similar vintage running flawlessly in my studios here in Denmark).

Central vacuum cleaner

Another part of Aladdins cave in the basement was the central vacuum cleaner - installed as new in 1934. From here a network of pipes ran to all public areas, into which the cleaning staff could simply plug their hose in to vaccuum the carpets and floors. This system moved some serious dust over the years, along with much lost change, jewellery and stage hardware. Emptying the dust container was a grim task which the stage crew were thankfully not required to do.

HVAC

As Chief Engineer I was also responsible for the operation and maintenance of the theatre's heating ventilation and air condition system, comprising equipment mostly of 1934 vintage.

We ran two huge heavy fuel oil boilers (converted in the 50's from coal burning) and a smaller oil fired boiler to provide hot water in the summer months. With such a large installation with many radiators, baths, showers and sinks, there was always the problem of leaks so the water pressure and consumption had to be logged and checked daily.

The air conditioning system (for the public areas) was awsome. Built long before the days of zinc ducting, most of the air ducts were constructed in brickwork or concrete before the interior of the building was fitted out, leaving a mysterious warren of tunnels under the floors, behind the walls and between the auditorium levels.

Curiously this network of tunnels was never used for other pipework for electrical trunking, which made maintenance of these difficult, as we had no drawings of where such utilities were located. Neither as there any lighting in these tunnels - but at least we couldn't see the rats.

The air conditioning plant was located in the cellar adjacent to the boiler room. Two huge venturi fans drew fresh air into the building, and pushed it through a dual system that included a cold water plenum, a hot water plenum, and a hot water radiator manifold. The system was very efficient but never discreet - it could deliver air of the same temperature to all public areas, regardless of their local temperature or humidity, so the stalls might be coolish whilst the upper gallery would be sweating - the only way to balance the air conditioning was to adjust the baffles on the duct outlets in each area - a task that was cumbersome and fraught with experiment.

Like many theatres the New was built over an underground river, which vented its banks during rainy periods in the cellar - to mitigate this there were several bilge pumps to keep the water level below floor level. During the winter these pumps would be running continuously for weeks on end.

Other maintenance

We might have been drawn to the theatre by the smell of the greasepaint and the roar of the crowd, but for stage crew and electrics crew alike our duties included maintaining almost every part of the building fabric. We did have a house painter to tackle that work - he was also the projectionist and follow spot operator.

The stage crew were responsible for repairing seats (always a lousy job after a rock concert), doors, carpetry, curtains and carpets.

The electrics crew handled the daily maintenance and checks of toilets, hot and cold water taps, radiators and other portable electrical equipment.

When we weren't doing all of the above, we were engaged in theatrical activities :)