MOTAT SOCIETY

The Squeaky Wheel

Issue #44 - October 2022

IDENTITY CRISIS NO MORE

Making replica factory plates for MOTAT's locomotives

These days when a new machine comes out of a workshop it will generally have the logo of the firm that built it stickered on it somewhere and a little engraved stainless steel specification plate. Functional, but hardly eye-catching.

Things were a little different a century ago. Locomotives in particular rolled out of the factory with cast brass plates with the engine's makers number cast into the plate itself. The plates were polished bright and, with the right crews, stayed so over the course of their life. Because of their decorative value they did sometimes get souvenired, ending up on mantelpieces and inside sheds. As steam made way for more modern forms of traction the plates became collector's items, to the point that many plates off condemned engines were sold, if they hadn't been stolen already. Some plates, especially off well-known engines, can now command eye-watering prices.

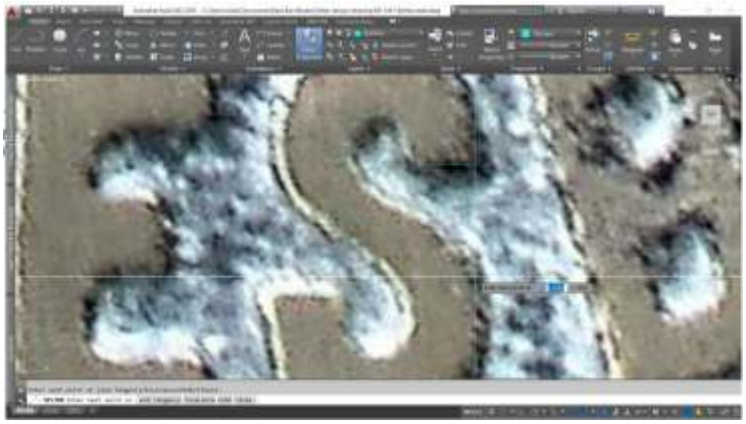
Two of MOTAT's engines lost their plates a long time ago, well before they entered preservation. These engines are Orenstein & Koppel 1411 "Bertha" and the Oberursel 5774, NZ's oldest petrol locomotive. It's about time they got some of their identities back.

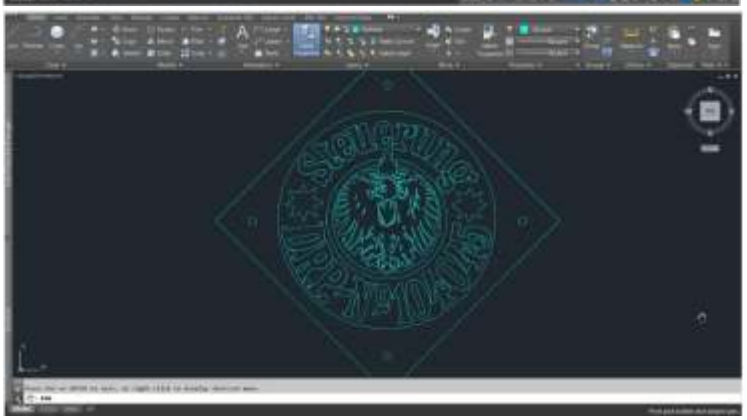
So, where do you even start on this task? Fortunately, the author has some experience tracing plates for models. There is a difference in making a model and the real deal but the idea is the same. The first step was to find something to trace. We are lucky to have a large number of early photographs that are available online through Archives New Zealand. These include a couple of photos of Bertha when only a couple of years old, sporting her complement of plates. High-resolution images were requested, which revealed what the finer lines of text said. Armed with this the search was on to find photos that could be traced.

The German website lokschilder.info was a great starting point, showing the variety of O&K plates out there and crucially it came with dimensions of the plates. It appeared the maker's plate changed depending on which agent the loco was bought through, with our engine having a plate featuring the London-based agent. Eventually, a photo was found on Flickr of the right style of plate on the side of an Indian locomotive. Although Flickr doesn't allow you to download the complete photo, a cheeky workaround was found by taking screenshots of the photo fully zoomed in and then piecing the photos together in Microsoft Paint.

That was the main plate sorted but what of the little diamond shape plate? This proved to be a little harder.

The search started by finding other O&K engines with the plate and eventually a good-quality picture was found. This also





revealed why the second plate was there. It was to mark that the loco had O&K valve gear, protected by an Imperial German patent. That was the shape sorted but what of the size? The solution to that was to go back to the pictures of our loco, which were taken near enough to square on, and using both the bunker side and the big plate, scale the size of the little plate off the photo.

Drawing the plates

What follows next was a process that was simple enough but very tedious. Each feature had to be traced in painstaking detail. The weapon of choice for this was AutoCAD. First, the base pictures were inserted into the drawing space and scaled to 1:1 size. Then it was a case of zooming right in and tracing each letter bit by bit. The process took a few months of spare hours but it was a good way to keep busy during lockdown. Once the

Continued on page two...

Identity Crisis No More...*continued from page one*

Above: The finished 3D drawings ready for printing. More visible now is the shape in the middle of the patent plate. It is the imperial eagle of Germany. In 1904 Germany was still an empire with a Kaiser on the throne. Patents were issued from the imperial court. Steuerung translates to valvegear with D.R.P. standing for Deutsches Reichspatent, or German Imperial Patent.

drawing was complete it was overlaid on top of the photo of Bertha to double-check sizes and placement.

Turning a 2D tracing into a 3D model needed a change of software so the drawing was imported into Solidworks. After an emailed request, Museums Victoria kindly measured up the thicknesses of the O&K plate in their collection. With that final piece of information, the plate could be extruded out to 3D. The background of the plates had a fine diamond pattern. This seems to have been a German thing, with many German plates having a background like it. Modelling these proved harder than expected. The first pyramid, measuring just 1.2mm wide was easily drawn. The problem lay in the hundreds of copies needed to cover the whole background. Solidworks has a nice feature called Pattern Fill, which fills a chosen area with the item in a set pattern. So the feature got called up, the little pyramid and a boundary was selected. A widely spaced pattern showed up. So far so good.

Above: The final check - full size printouts of the plates taped to Bertha's bunker to check all the sizes are right.

Right & Below: The Oberursel maker's plate is a little more austere though still a bit of work with every line of text a different font. Photo: Rafael Wunderwald, Feldbahnmuseum Frankfurt

Above: A red letter day - the raw castings after arriving from the foundry.

Dial down the spacing to 1.2mm - the preview takes a while to pop up - hit OK and then the wait is on. A little while later, still no change. A few impatient clicks and the dreaded crash message pops up; "Solidworks is not responding and needs to close". Bugger, well, try again. Another go. Same result. Now my laptop is not exactly a low-end machine, though not quite at the level of a PC you would normally run powerful engineering software on. All those little pyramids were just a bit too much all at once to deal with quickly.

Time for some cunning... With something running in the background so that the laptop wouldn't go into standby mode, the stage was set. Again the pattern was set up, the OK button was hit and the wait started. After being left alone for a couple of hours there was a result! The save button was hit and that was the hard bit done. A few tweaks to the drawing and scaling up the whole model by 3% to account for shrinkage in the casting process finished the job.

Above: The big O&K plate fresh out of the machine shop and in a coat of primer.

Around this point, the idea was hatched to do the plate for the Oberursel loco undergoing restoration as well. With a couple of emails back and forth to the Feldbahnmuseum Frankfurt, which for now houses the only operating Oberursel loco in the world, photos were sent back of the Oberursel maker's plate that they had cast off an original. Again with a little time the photo turned into a 3D model.

Turning the virtual into reality

In the last few years, 3D printing has really taken off. There is now a large offering of processes on offer to suit different applications and geometries. For making the patterns from which to cast the plates it was the natural choice. A local firm on the North Shore was tried but they were not able to deliver a print-up to the task. Eventually, the choice fell on Shapeways, based in the US and Europe. Although their machines could produce the right resolution for a reasonable price, the machines were not quite big enough to fit the whole of the big O&K plate. It had to be split into three and even then the middle banner had to

be turned in just the right way for it to fit the printing boundaries. Fast forward a month or two and a Shapeways box showed up on my doorstep. After all that work finally something tangible, albeit with some assembly required. The printing and cleaning process warped some of the larger prints, but a generous amount of hot water softened the plastic enough to allow it to be straightened. Some glue and a little filling and sanding soon turned the component parts into one whole plate.

Time to find a Foundry. The original plates were cast in brass which has a distinctive yellow colour. Unfortunately, most foundries don't cast brass anymore because the zinc in the alloy gives off pretty nasty fumes. Fortunately, Skellerns in Rosebank was happy to cast in brass and had also done work for MOTAT before. After the usual formalities, the patterns were dropped off. Though promising, the first castings were hardly a success with some features not coming out and the patterns also suffering at the hands of the founders. Together with the Foundry staff, the two main issues diagnosed were the rake, or taper, not being enough to release the sand and the staff not being able to fish the pattern out of the mould easily. With the help of the foundry some tweaks were made to the pattern and it was time for round two. This time we were successful with a set of six clean castings. They were hefty specimens with the Foundry having added extra thickness to the back of the plate to make it easier to cast. It turned out that German foundries a century ago were capable of a feat a modern foundry couldn't - cast a thin plate.

Top row left to right: (1) The pair of O&K plates in their new home. (2) A close up of the patent plate.

Centre row right to left: (1) The plate and stamp showing the tape used to line up the stamp. (2) the result.

Right: The Oberursel plates ready to mount to the cowling which was then still on the drawing board.

Finishing the plates off

Not having had any experience in casting before I took a conservative approach, allowing a generous allowance on the face of the casting to be machined off to get a nice finish. Turns out it was overkill but I had little choice but to machine it off. So the milling machine in the Rail Section workshop was commandeered. For the next few Tuesdays I spent a lot of time making brass chips. To bring the plates to the right thickness a couple of millimetres had to be removed off the back of each plate. This proved to be a bit trickier than first thought. Casting sets up stresses inside metal and by machining some material off the back of the plates they tended to warp making machining them a nightmare. With elaborate clamping that problem got solved, resulting in a nice flat plate of the proper thickness.

To clean small casting flaws up a special carving tool was ground up from a file and with some help and advice from Martyn Radford the plates were ground flat and polished bright.

To finish the plates off the background of the plates was given a couple of coats of gloss black and to aid future historians the back was stamped to indicate they were replicas. Fast forward a year, and with both engines still in the workshop one final thing remained. The maker's number of the Oberursel locomotive had been in question. Unlike steam engines, which are easily traced through records of boiler inspections, there is next to no documentation on the loco. All we know is the first and last owners with a 30-year gap in the middle. Factory records were non-existent courtesy of a bit of bombing during WWII. Unlike most engines where parts were stamped with the engine's maker's number, Oberursel stamped parts with a part number. Discussing this with the Frankfurt Feldbahnmuseum we agreed that the number stamped on the flywheel and crankshaft - 5774 - was in all likelihood the maker's number. Now at this point, I could have grabbed any old number stamp and finished the job, however, the original stamps were of a distinctive and much less utilitarian font than what you get in a modern set of number stamps. It didn't take much to take a few photos of the original stamps, trace them and extrude them out to a 3D model for a stamp. Another Rail volunteer, David Graham, kindly agreed to use the CNC machining centres he runs at work to machine them out of some tool steel. After a trial run and some tweaks, he produced a one-piece stamp which produced a perfect impression. After a few dummy runs on some scrap material to get the feel for it the plates got their stamped numbers in a hydraulic press, finishing the job in style. The plates are now sitting there ready to mount as soon as both engines receive their final coat of paint in preparation to returning to service.

All in all, it was an interesting leap into using modern methods to reproduce long-lost parts of engines, adding a few more shiny bits to the engines as well as returning them closer to an authentic representation of how they ran in service. It has since served as a springboard for other exciting developments for the two engines. But that, as they say, is a story for another day.

Article and Pictures by Rick Schreuder

THE MOTAT SOCIETY CONTACTS

Postal: PO Box 44430, Pt Chevalier, Auckland 1246
Administrator: Jodie Cawthorne - 021 389 114 - admin@motatsociety.org.nz
Website: www.motatsociety.org.nz
Facebook: www.facebook.com/themotatsociety
Instagram: www.instagram.com/motatsociety/

Contributions to the MOTAT Society quarterly The Squeaky Wheel newsletter and/or monthly Events and Announcements newsletter can be sent to admin@motatsociety.org.nz.

BATTLE OF BRITAIN COMMEMORATION
Sir Keith Park Memorial Airfield, Thames

The 11th of September saw Thames' Sir Keith Park Memorial Airfield's 3rd commemoration of Sir Keith Park, "the Defender of London". Born in Thames the Royal Air Force Commander lead the RAF Group that bore the brunt of the German aerial assault during the Battle of Britain.

Accompanying wreath laying and a Harvard Plane flypast, speeches were made by Thames Mayor Sandra Goudie, Group Captain Mike Cannon - Commanding Officer RNZAF Auckland, Base, Whenuapai and Hon. Scott Simpson, MP for Coromandel. Due to attending the funeral and memorial services for Her Majesty Queen Elizabeth II, His Excellency Dr Richard Davies – Consort to the Governor-General, and RAF Wing Commander Andy Bryant – UK Defence Advisor to the NZ Government, were unable to attend as planned. A moment of silence was held during the event in Her Majesty's honour.

THE WILLIAM C. DALDY PRESERVATION SOCIETY
Presents... Heritage Weekend this October

Public Sailings : 14th/15th October

1.5hr harbour trips 10am, 12.30pm & 2.30pm.

For more info: www.daldy.co.nz,
www.facebook.com/WCDALDY, or
http://www.heritagefestival.co.nz/events/
"Auckland Harbour tug tour"

Bookings at www.eventbrite.co.nz/e/auckland-heritage-weekend-sailings-tickets-373573768197

MOTAT SOCIETY

THE MOTAT SOCIETY SGM/AGM

16 November 2022, Room D4, MOTAT 1

Special General Meeting - 6.00pm

Annual General Meeting - 6.30pm

Please join your fellow members at the MOTAT Society Special General Meeting to decide on proposed changes to MOTAT Society Rules.

Following the SGM the Society's Annual General Meeting will commence with the Election of Officers to the MOTAT Society Committee and the presentation and discussion of Notices of Motion.

Nominations are invited for the Election of Officers to the MOTAT Society Committee and may come from, and be seconded by, any Society member who is not an employee of Auckland City either directly or indirectly through an Auckland City-owned company or organisation.

Notices of Motion are invited for presentation and discussion, under the guidance of the Chairman and via correct debatng rules, at the MOTAT Society AGM.

Nominations and Notices of Motion are required to be provided in person or via admin@motatsociety.org.nz by the time of the commencement of the Annual General Meeting.