1). INTRODUCTION :

No. 3046 steams again!

The stored No.3046 being shunted in 2009.

Class 15F No.3046 was the first locomotive that was allocated to the Reefsteamers for restoration back in the early 90's. This was a full frames-up rebuild. Unfortunately, the massive project was consuming time and money, and the prehistoric Reefsteamers needed to earn clams to pay for the bear skins. So when other locomotives, such as the Class 12AR No.1535 'Susan', became available for restoration, they were worked on instead. Gradually the No.3046 was reassembled and the locomotive was treated to a paint job. She is essentially a brand new engine.

But eventually she got left on the number two road in the old 15M workshop as the small but constantly growing stable of operating locomotives gradually took all the time and attention.

The final assembly of No.3046 began when Peter 'Lappies' Labuscagne rejoined Reefsteamers in 2009. He was one of the original team members who worked on this engine in the early years. Peter is a qualified and experienced steam fitter and being newly retired, would have time on his hands to refit all the pipe work, boiler fittings and assorted hardware to good old No.3046. Peter is not a volunteer. He is one of the few paid employees of Reefsteamers and receives a basic salary to supplement his pension. It must be said that Peter Labuscagne certainly delivers value for money!

Fixing No.3046 would be a project of taking parts from the brass store and borrowing parts from Class 15F No.3016 'Gerda' and a few small components from the Class 15F No.2914 'Spikkels' – both of which are in long term storage waiting for funds for expensive firebox repairs. Some people initially weren't happy with the idea of borrowing spares from one locomotive to fix another. However, we'd rather use the parts that we have – and they are a lot less vulnerable to theft when they are safely bolted to an active locomotive rather than on a dusty machine parked out exposed in the storage lines. It isn't a stripping exercise, but more like maximizing the use of the limited brass-backed resources that we do have.

Our ambition is to get a stable of two or three 'smaller' locomotives running – the 12AR for sure, the 12R Rosie and maybe one of the smaller locos from Millsite. To run Reefsteamers more like an effective business, we need to use the cheapest, smallest locomotive that can do the job without busting her gussets. A mechanically stoked Class 15F is still a bit pricey to run. We need a more economical locomotive as a stand-in for when our Class 12AR No.1535 'Susan', currently in service, has to come in for attention after her four month cycles. (Hence, our interest in getting the 12R running again.)

Although Class 15F spares were being used – the pipe work becomes non-compatible with the changes done to locomotives over the years. So every pipe had to be refitted and re-terminated. Although it might seem that I've focused on the faults in the report, the locomotive actually did very well being steamed up for the first time with a mismatched set of pipes and fittings. Peter Labuscagne and his able assistant, Victor Zwane, did a sterling job over the past few months.

This boiler re-certification was paid for in full by a donation from the **Two Foot Preservation Trust.**

In spite of the 'Two-Foot' in their name, they are also interested in preservation of Cape Gauge equipment. Some belated credit should go towards the fact that they have also paid for the re-certification of the Class 12AR No.1535 'Susan' after her recent firebox repairs and they have also made a partial donation towards the 3-yearly boiler certification of Sandstone Heritage Trust's GMAM Garratt No.4079 'Lyndie Lou.'

On behalf of Reefsteamers, thank you.

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Today's steam test (9th April) would be an afternoon of fixing the little problems and snags that, in spite of prior best efforts, only become apparent when the locomotive is finally put under steam. Remember that a boiler hydraulic test only tests the boiler and firebox for leaks – it does not test the myriad joints and pipes and the many valves. It certainly doesn't test the working components such as the stoker motor, the grate shaker, the dynamo, injectors, the brake vacuum ejector or the powered reverser. The safety valves can only be very roughly set on the bench by adjusting the springs to a preset length. Not even the super heater elements can be checked properly as they are behind the regulator valve in the steam circuit.

As this was a Friday afternoon, the steam test's audience was mainly retired people or the few of us that are fortunate enough to work 'flexible-ish' hours. Still, there were two photographers and the esteemed editor of the 'Reefsteamers Waybill' newsletter was there, along with assorted other steamed fruitcakes.

ST01A – Optimistic Boiler Pressure.

I 'rocked up' for the No.3046 steam show n' blow at 1:10pm after a rather distracted half-morning at work. I was meant to be working on Internal Project Docket Templates but couldn't concentrate and ended up doodling fat-boilered Pacifics. I always used to doodle locomotives with either four or two driving axles, but ever since a certain 'Little Empress' came into my life, always a triple-driver machine. I caved in at 12:15, said a hasty farewell to the bemused Developers and showed my tail at the Reception Desk.

But from the desk to the depot. The Class 15F's fire had been lit just over 4 hours ago, at 9am. The pressure was starting to lift nicely at about 300kPa by the time I arrived and the annoying but inevitable steam leaks were now becoming apparent. She was already independent – the draft blower had already been withdrawn from the chimney.

ST01B – Warming up and looking good.

It is obvious that this rebuild project isn't quite completed. Even without the gremlins to be chased up and the leaks that we would find, the front end of the locomotive still needs to be painted, all the smoke deflector hardware re-mounted, all the oil pots need to be re-trimmed, the brakes need major adjustment and the electrical wiring needs to be done. That front brake pipe was loose too – discovered when I used it as a handhold to climb up. Oops! ☺

But still … this is less of a dusty-boilered project and more like a very nearly serviceable locomotive – with a kiln-hot firebox and the boiler just starting to sizzle enthusiastically.

At 1:15pm – the triple-chime whistle was blown for the first time in 18 years – a deep brass-throated toot of joy at coming back to life once more.

ST02 - Newly mounted headlamp.

One of the first things that I noticed was the new headlamp mounting. It was nice to see the charismatic Pyle National Lamp back in its proper place on the headlamp bracket, rather than awkwardly perched on the inverted regulator cover on the chimney. However, it has yet to be wired up.

The locomotive's name plate will be mounted on the forehead rail rather than suspended from angle brackets attacked to the more convenient flat plate – as there it gets in the way of the door being opened.

Notice an extra feature on this locomotive. Peter rigged up a set of grab handles for the gusset brackets. This Class 15F was originally planned to run sans smoke deflectors. While that makes for a more streamlined appearance, it also means that there would be less useful handholds, particularly for the insertion of a plant-based blower ring or for front end work.

Notice the 'Monkey Nuts.' They are actually all of the same sizes, being threaded onto 20mm diameter bolts, but the bolts are of different lengths. When everything is settled, tested and dusted, the longer bolts are going to be ground back to have roughly three threads protruding. In keeping with the current Reefsteamers policy of running neat but utilitarian machines, like steam powered Moore sculptures, we will not be machining and fitting decorative brass dome nuts to the smokebox.

ST03A – Victor and Shorty discuss leak busting.

Victor Zwane (Right) looks a bit glum as he looks at the stubbornly leaking manhole cover. With the boiler starting to perk nicely at 350 plus kPa, the steam leak is starting to pick up force. There were actually two leaks, both blowing off to the right hand side.

Victor had tried to tighten the nuts and was getting quite stressed out in that he couldn't resolve the leak. 'Lappies' Labuscagne had to call him off the job and to get busy on the injectors before things got a bit too heated – literally.

Victor Zwane was originally employed as a labourer and a base-level handyman but has now become Peter Labuscagne's primary assistant for locomotive fitting and assembly work. He has learnt quite a lot and is putting his newfound fitting skills to use.

ST03B - Steam leak at the Manhole Cover.

The problem was discovered to be two stripped studs rather than an issue with the gasket itself. You can, in fact, see how one of the studs has come partially unthreaded and protrudes above the rest at about 10 o' clock to the center. A locomotive's steam dome is sealed with a ring of copper that is crushed between the rough-ish steel surfaces to make a good seal. So that ring o' ring o' studs do take a bit of a beating over the years as they have to be tightened to a high torque to make a good seal. .

On the Class 15F type locomotive, this 'dome' is actually just a manhole cover. The steam is picked up from the very top of the boiler's rear steam space by an internal dry pipe arrangement. The pressure-resisting convex profile of this cover can be clearly seen under the spanner.

ST04 – Leak at a valve gland.

Such a minor problem and one that is so inevitable during a steam test such that it would be remarkable if none of these faults occurred on the entire locomotive. Here's a minor leak at the turret valve that supplies steam to the left injector's Sellar's valve. Quite often these leaks can be corrected by 'nipping' up the packing nut, especially if the packing has been newly installed and is still 'springy.' However, the compressed packing also squeezes against the valve spindle and thus makes the valve wheel harder to turn from within the cab. The small pipe under my hand is the supply line to the blower.

As it turned out, the packing for the left injector's water valve (The putt handle under the fireman's seat) had been compressed too well and the very stiff valve was proving to be awkward to use in practice.

This was the only valve on the entire turret that was leaking. They will all need to be adjusted after the first run but by then the graphite rope packing will have settled into service.

As I was climbing around happily, I had to keep reminding myself that this locomotive is now hot and not just to grab any old pipe or handy boiler fitting for a convenient handhold which I've been doing for several weeks. It worked and I didn't burn myself once. ☺

ST05 - Leak at left-side injector delivery flange gasket

Another minor problem. We had a leak at the synthetic gasket at the delivery flange of the left-side injector.

This isn't a technically difficult problem to solve as it simply means unbolting the injector and making a new gasket. There are literally 14 flange bolts to undo, two mounting bolts and then the injector can be withdrawn. And none of those bolts will be corroded or seized as that injector was recently installed. But it's a nasty job when all the brass and copper is piping hot.

Standard Klingerite gasket material, as was fitted, doesn't work here. A thicker graphited gasket needs to be used. Inferior or wrong grades of gasket will literally blow out in 5 minutes on the steam supply (Top pipe) or the delivery side of the injector as shown here. The problem stems from the fact that brass flanges tend to take on a 'set' around the bolts over years of being tightly clamped together around a gasket. The flange surfaces eventually end up being slightly warped and often in two planes, especially after 50 odd years of use and sometimes on different locomotives! Warping is even more likely if impatient fitters or even footplate crews 'gorilla' the nuts in a misguided attempt to seal a persistent leak.

This leak isn't all that serious as injector leaks go and will probably be resolved with the use of a thicker gasket. But this is one of those problems you cannot detect until the engine is put under steam, even with a perfectly trimmed and fitted gasket. A severe leak due to warped flanges can be resolved by milling the flanges down, or by using two gaskets and a separator plate in between them – but this causes misalignment and consequent stress in the pipe work unless the pipes are corrected.

A leak on the suction side (Top Valve), although not likely to blow out, will cause injector problems as it will suck air in when the injector is running and tend to collapse the suction required to lift the cone.

ST05B – Serviced tender brakes.

One of the less 'exciting' jobs was the resetting and checking of the tender's brakes. There are a lot of linkages here with six axles and twelve wheels to rub up the right way. And as it turned out, not much vacuum with which to do it.

Notice the white 'GMR' stencils on the two brake cylinders. That stands for 'Germiston' and shows when those cylinders were last inspected. On the rear quarters will be the dates of inspection of those cylinders.

ST09C – Vantage Point.

The tender has been cleaned up and the buffer beam repainted. The dangerous fraying friction tape that was originally wrapped on the deck rails has been removed. All the original hardware is in place, including an aux water tanker transfer pipe. (Second from the right.)

One legal requirement still to be fulfilled is the placing of a warning sticker to remind crews of the danger of climbing up that ladder with the locomotive (and tender of course) under electric traction wires.

ST06A - Tightening a pipe union of the stoker gear.

The first test of the mechanical stoker resulted in much steam jetting up this corner of the cab once the stoker tried to take up the load and the pipes were pressurized. It was a leak at a pipe union and typically, one of the most awkward unions to reach on a locomotive backhead. Andrew King is tightening up the faulty union right above the converging tee-off for the bypass valve. This dramatic looking leak, with its upward blast, was the only pipe union related leak within the cab.

The small valve, known as the 'Bypass Valve' (lower center of photo) is used as fine control for the stoker's steam supply. The large valve is traditionally called 'The Booster Valve' and is used to give the stoker's engine a good whack of steam to clear an obstruction or to handle wet or consolidated coal. Normally, the bypass valve is adequate for normal operation.

ST06B – Stoker Valve Bypass Pipe.

The mech. stoker is operated by two valves connected in parallel on the same steam line. The bypass pipe tees off just under the green-glitter decorated pan-handled jet valve.

However, using the little Bypass Valve does result is a delay before the stoker's steam engine actually responds to the fireman's adjustments. It is easy for the inexperienced operator to over-shoot and then over-correct. The operator should actually look at the stoker's pressure gauge, which responds quickly being at the live end of the feed, and then wait for the stoker to respond. Once the fairly lengthy steam line between the locomotive's backhead and the stoker engine in the tender is filled during a single cycle of operation, the stoker's response is generally quicker.

The arrangement of the valves is a bit unusual here as they are normally mounted higher and closer together on a 15F.

ST07 – Firing hole with custom-built table and latch.

Fire in the Hole! Looks quite good with a fire in it, doesn't it? ☺
The mechanically stoked 15F has one of the hardest fireboxes to get into, so the door, the latch and the table are usually removed to ease access for the boiler tests and inspection. The table was custom built by Peter Labuscagne. On a standard 15F's table the fire door latch swings to the left – this one is a more primitive latch that swings to the right. It means longer and slightly slower movement, but it does maximize the table's useful space.

The cat-flap' like swing-in firebox door on the mechanically stoked Class 15F is designed to be a draft breaker. On a live locomotive, the firebox usually has a slight negative air pressure and draws oxygen bearing air up through the fire bed. But opening the doors 'short circuits' the air flow. Apart from the process of manual firing, the doors can be left partially open to allow extra draft for smokeless operation or simply to mix in cold air to slow down raising of steam on a hot boiler. (At stand still.) This inward opening door forces the cold air inwards and downwards above the fire, thus it mixes better with the combustion gasses and is less likely to 'shock' the boiler while providing a slight cooling effect. Excess cabin air impinging on the hot rear tube plate causes localized contraction and subsequent stresses – particularly in the boiler tube beads.

ST08 - Steam people in the cab.

Mendicants at the altar of fire.

Although Peter Labuscagne (center) was the team leader in terms of finishing off the pipe work and fittings of the locomotive, Engineering Manager, Andrew King (Foreground), is ultimately in charge of the eventual safety, mechanical and roadworthiness of the locomotive. Seen here, Andrew is still 'cornered', wrestling with the stoker's bypass valve union while Peter looks on a bit anxiously from his check of the rising steam and the various gauges on the backhead.

Although 'Oom' Attie de Necker lit up the fire, Saki Kekana (Background) took over the steam raising duties. He was hoping for a supervised drive around the turning balloon but that wasn't to happen today.

ST09 - Stewart Currie polishes the tender.

Polishing plate work instead of computer keyboards, in the background amongst the steadily heating action, Stewart Currie just quietly gets on with buffing up the tender. Although Stewart is not bad with his hands, he tends to stick to the lighter duties. Stewart is our club historian and archivist, as well as the editor of the monthly Reefsteamers Waybill. So it' is only natural that he would be here on this occasion – a pair of wild 15F's couldn't pull him away.

The tender has come up shiny enough in this picture but the paintwork is uneven. In the first round of restoration several years ago, the very thick paintwork, from years of re-applied paint, was inadvisably ground down with a flapper wheel. It left an uneven finish marked with ground-in swirls. The tender will either need to have a complete corrective coat of paint added, or it must be stripped down to the metal and repainted in duco for a smoother finish.

ST09B – The 'other' photographer.

That's professional photographer Diana 'Dysie' Sanderson smiling up at me after we had just had a duel of zoom lenses. Like Stewart in the previous photo, there was absolutely no way that she was going to miss the steam testing. Check out her album on her FaceBook profile for her angles on the event.

Marketing Manager Les Smith is chatting in the middle and is another rare visitor to the depot. Like Jacob Marley's ghost, he is usually tied down to ledgers, ticket books, phones and fax machines. But here, he's getting a good dose of hot steel, ferric-scented steam and some action that reminds him of his good old main line firing days.

ST09C – Vantage Point.

Stewart Currie has just climbed up onto the patiently waiting Class 12R No.1947 'Rosie' to get a higher vantage point. He's quite spry for an old boy – but maybe the enthusiasm for steam alleviates the arthritis!

Compare this picture of an old-school low-pitched boiler with picture No.ST13 for a contrast in boiler pitches across two different generations of locomotive design. The first of the 'high pitch' locomotives was the Class 15CA which caused many nervous glances when they were first released. It was thought that they would be too unstable in use on the Cape Gauge.

ST11 - Tightening leaky pipe unions.

ST11B – Eish! Not another one!

The steam supply line for the Sellar's valve of both injectors had a slight leak on the unions from the respective turret valves. (The brass valve just behind the spanner.) But because this section of the pipe is usually permanently pressurized with the locomotive running, even a fairly mild steam leak at this location is unacceptable – especially as the Sellar's valve (just left of Victor's feet) is in front of the crew's windows. The crew, does of course, have the option of turning off the injector steam at the turret valve (where the spanner is) but it would get tedious operating that valve, then using the pull rod for the Sellar's valve, to supply steam to the injector. The Sellar's valve is designed to open and close quickly.

This is probably the most classic motivation for a steam test for it is very difficult to test a joint or a pipe union on the bench.

The use of a mallet to tighten or loosen fittings on a locomotive is fairly common – because the tightness of the fitting would otherwise require a long cheater bar or a long, heavy and unwieldy spanner. In fact, there are many spanners with purposely enlarged handles which are designed for this use and we call them 'slogging spanners.' The spanner pictured here is, however, incorrect – it is a standard spanner and should have been used with a cheater pipe.

If this was a fully functioning locomotive, Victor wouldn't have been able to stand on the cab's fore-braces like that. That back pipe running behind his knees is the exhaust pipe for the brake ejector. It would normally be hot in use – but the ejector had proven to be faulty earlier on in the day and the steam supply for the brake ejector was completely switched off. So Victor got away without steam-heated synovial fluid – let alone the toasted 'buns' from that wide-bodied firebox.

ST12 - Crew at work.

With Victor and Shorty beating some torque into their recalcitrant pipe union, Andrew King stands above the firebox and ponders the increasingly violent steam leak skirling from the manhole cover. (Dome) As the pressure was starting to rise, those two steam leaks were becoming increasingly volcanic. Andrew wasn't so much worried about the manhole cover's copper-ring gasket blowing out, but the fact that he would be working on the safety valves right next door. He's just about to remove the split pins and the bonnet nuts from the four still-quiescent Ross pop safety valves.

On a machine in service, a leak like this would be totally unacceptable as it would eventually cut through the metal work with the constant abrasion of the steam. This is how valve seats get incapacitating notches from the tiniest imperfections.

Meanwhile, Peter Labuscagne is standing on the walkway and investigating incipient gasket trouble on the reverser's power cylinder. He would soon be asking Victor to demount the valve assembly and make a new gasket from scratch.

ST13 - Front view of Class 15F No.3046.

Here's the front view of the iron lady in question. That smokebox front cover was an exercise in frustration as the holes were out of alignment. It appears that the front cover had been swapped out from a different locomotive in the past, one that had a slightly different bolt position on the front flange. This plate was drilled out with a set of new holes and the existing holes blanked. But the misalignment tilted the opposite way. A third set of holes had to be drilled to get the alignment that you see here. The holes left behind were firmly plugged up with custom turned 22mm plugs. When the front plate was re-primed after the plugs were inserted – you actually cannot tell where they have been put in.

As mentioned in a previous report, it wasn't just a matter of aesthetics, and the locomotive would run just as well with a slightly 'skeef' smokebox front plate. But that heavy access door may suddenly unexpectedly swing open or closed because of the tilted hinge pin and hurt someone.

This primer-tinted front view is educational as the sloped front valance plate is missing from between the two red painted riser boards with their steps. Thus, you can see clearly how the two cylinder and valve assemblies (the 'Steam Chests') bolt together. The semi-circular section is known as the 'smokebox saddle' and is actually the only area where the boiler of a conventional steam locomotive is rigidly attached to the locomotive's frame. Along the length of the boiler, support is given by transverse waist plates, which are designed to buckle slightly as the boiler and firebox expanded with the heat. The boiler assembly grows longer and the backhead actually moves back slightly on sliding mounts into the cab.

Also obvious in the picture is the high pitch of the boiler – 'pitch' being the height of the center line from the rail heads. A high pitched boiler can be unstable, in theory, hence the railways' initial reluctance to use them. But it allows for a deeper firebox, straighter steam passages to and from the cylinders and for bigger diameter wheels. Remember this is cape gauge so the locomotive designers have to try and fit the wheels, which are only 3ft 6 inches apart, under the boiler – but still keep the boiler diameter large enough to be useful, and still have a safe and smooth running locomotive Those boilers were found to be stable enough on the cape gauge. .

ST14 - Removal of Reverser's Power Valve.

Peter is just about done with removing the power reverser's valve and is removing the last of 6 nuts. The lack of steam escaping from the removed pipe (visible just under Peter's hand) is evidence of the good job that has been done in servicing and seating the power reverser's supply valve in the turret. This is normally much warmer and humid work! He would be removing the valve chamber (rectangular block) with the brass displacement lubricator still attached.

The locomotive had been professionally spray painted in Duco by the Ackerman brothers and the automotive finish is evidence by Peter's reflection. Unfortunately, the chemicals used to remove the oxidation and the verdigris from the copper pipe work has left 'hard' chemical drip trails under the pipes. It has caused some cussing but there's nothing to be done now except to try and find a way to remove those trails. We do not have the time or manpower to rub those trails down and re-spray the boiler.

ST15 - Disconnected regulator linkage.

In the interests of safety, especially with a somewhat excitable audience present, the regulator ('Throttle') remained disconnected. But not just the audience, we also had a multiple work team with each person concentrating on their own task and under a tightening deadline … the sort of scenario from which accidents so easily arise.

The red pull-rod visible here moves backwards to turn the crank clockwise (towards the cab end) and open the regulator. So if someone pulls the cab's regulator lever in this state, the open clevis link would just move impotently to the right and drop down harmlessly behind the stationary crank. The effect would jam the rods and once the regulator to stay open within the cab, but at least the locomotive wouldn't move.

There is no leak here for the steam test, which is a good sign.

ST16 - Left hand side clack valve.

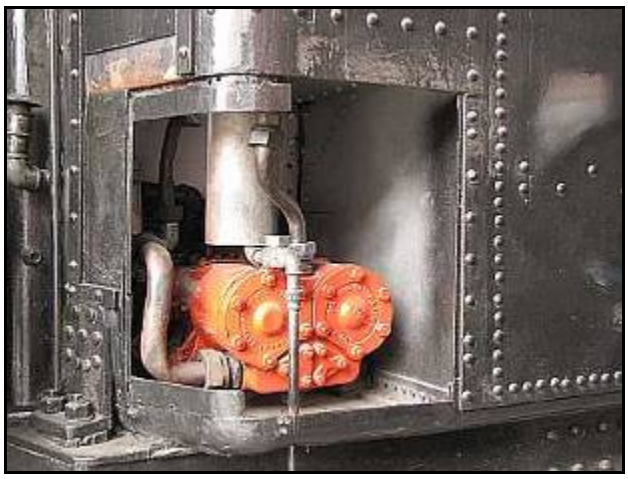
The two clack valves, often troublesome on a first steam test, behaved quite well for this job. This somewhat oxidized brass casting is sometimes known as a 'clack box', although the term is more correctly used for the more usual type of mounting – with a side-by-side valve arrangement mounted at 12 o clock on the boiler.

The steam visible in the background of the picture is blowing from the leaking manhole (dome) cover

On the Class 15F, the valves are located at 11 and 1 o' clock on the boiler respectively, to reduce the overall height requirement of the locomotive, especially with the characteristic high-pitched boiler. (They are both located on the left side on the Class 25NC.) The actual one way valve, the unsprung 'clack valve' which seals the pressure within the boiler is housed in the bowl on the right side. The feed water from the tender, ingeniously pressurized by the Gifford type injectors comes into the boiler through the copper delivery pipe at the bottom right.

That delivery pipe is a frequent source of burns for the careless cleaner or fitter using the red painted regulator pull rod as a hand rail.

The clack valve can be manually isolated from the boiler pressure via means of the protruding square shank, should trouble arise. Should the valve leak or stick upon, the 'check sticking up' as the Americans say, the steam from the boiler gets through the check valve and can blows back annoyingly through the injector and out through the overflow pipe. It initially looks as if the injector's steam valve has been left open. The practice on South African railways locomotives though is to have a separate one-way valve, a globe type, under the running boards on either side. It helps to protect the injectors form blow-back, and helps to keep the rising part of the delivery pipe full. It's main purpose, however, is to provide a valve that is close-able from ground level should a clack valve problem develop.



ST17A – Stoker Compartment.

It's going to be a long time before you see a nice clean stoker compartment like this again! There is often some variance in the fittings in these compartments when locomotives have been bodged n; repaired over the years.

The silvery cylinder in the foreground is the water separator for the incoming steam. The condensate must be drained, as per the main traction cylinders, as the water is incompressible. If enough water gets into the twin double acting cylinders, the 'little' engine would lock up. The stoker system is prone to condensation too, as there is a long steam-condensing length of piping between the stoker controls in the cab and this compartment.

In forward mode, that big copper pipe in the corner is the exhaust pipe. It leads back to the changeover valve – and acts as the inlet pipe if the stoker is set to run in reverse.

ST17B – Confined space around the Stoker.

Within the cramped confines of the tender's stoker compartment, tightening a leaky pipe union takes on a whole new challenge as there is little room to either swing a mallet or to add a cheater pipe, much less to swing the proverbial feline. Here you can see that it is taking two fellows to guide the crescent spanner. A leak in the stoker's steam supply lines obviously reduces the pressure available to drive the stoker's engine. But the effect is also to increase the existing hysteresis, that is, the lag between the operation of the controls by the fireman and the response of the stoker. So the fireman would tend to overshoot his settings.

The vertical cylinder to the left is the changeover valve and is used to reverse the direction of the stoker should the Archimedean screw jam up – typically because of foreign bodies that got mixed in with the coal.

ST18 – New tender Interconnection Hoses.

As shown by our adoption of Vesconite™ as a bearing material, Reefsteamers is not averse to using modern materials, techniques and components where necessary. New solutions for old machines, as if it were.

Here is another example – the use of modern industrial hoses in between the locomotive (left) and the tender. Mr. Stripy is the left-side tender water feed hose, and the neat blue hose is a high-temperature hydraulic hose used for the stoker steam supply. Normally the stoker is supplied though is a set of individual pipes connected with a McLaughlin coupling which can be prone to leaks as a swiveling joint in otherwise rigid pipe work.

The stripy hose is internally braced with a spiral spring, with a 76mm internal diameter and is designed to be a suction hose. It needs to have the spring reinforcing as per the standard hose, otherwise it would kink closed if the locomotive rounds a tight curve, in addition to the risk of collapsing under suction.

Yes, the colours are bright and somewhat toy-like but these hoses will soon weather down to a uniform coal dust sprinkled grimy black and even the most pernickety rivet-counting photographer wouldn't even notice them.

ST19 – Quarter view in the sunlight.

ST19 – The sun valiantly broke through the gloomy clouds for brief periods in the mid afternoon, highlighting the professionally painted cab, boiler cladding and the cylinder chests.

The front end valance plate (the wind deflector), that normally fits in between the two oxide red-painted walkway risers is still missing. We were hoping to visually backdate this locomotive to resemble the very first series that was built WITHOUT smoke deflectors. They also ran without the valance plate too, so the missing plate is deliberate. Unfortunately, the Rail Safety Regulator has objected to this and so the smoke deflectors (and the deflector plate) will be re-installed.

The locomotive had been pulled forward earlier in the week to use the coal grab wagon to get some kibble into the tender, and then partially shunted back. We borrowed some coal from the tender of Dave Shepherd's 15F No.3052. No.3046 ended up in this position primarily to line up the manhole cover (dome) with the gantry crane for convenient and safe removal of the aforesaid steel head-banger. Incidentally, the chimney stack and the safeties are clear of the unvented workshop roof. The right hand blow down valve is also free to discharge into the open air.

ST20 – Bogie wheel reflections.

The front bogie wheel is reflected in the ever growing pool of condensate water. The wheels on this locomotive were left in their original painted state with the paint in a serious state of grunginess. So many locomotive and shed crews painted their wheel rims white for decoration that it almost became a standard feature. We are planning to remove the paint altogether and run the locomotive with polished steel rims. But in the mean time, even the grungy paint protects the steel castings from the hungry ferrous moths.

Painted locomotive wheels rarely stay clean for long – and the bogie wheels and the leading drivers are very prone to being fouled by the oil discharge in the cylinder cocks and drips from the valve motion. It is actually easier to keep well oiled bare steel wheels clean if they are lightly anointed with oil before a run. However, they do rust and oxidize quicker if the locomotive is standing for a while.

ST20B – Low angle perspective.

Doesn't she look great? And she's still a work in progress. This particular engine was one of 44 engines that received official names by the SAR in 1944 – and she bore the name 'City of Bloemfontein' on the smokebox deflectors' wing emblems. She was but one year old then and would still have another 54 years of service ahead of her. In general, the naming of steam locomotives with female names by the crews was actually an unofficial practice – but the SAR+H didn't mind, as it helped instill pride in their machines.

It eventually became common for locomotives to bear 'City Wings' on their deflectors and a woman's name on her forehead. The 'City Wings' tradition then changed to indicating the home depot rather than being a name.

This Class 15F No.3046 'Elizabeth' (maybe) was initially put into service in the Cape Midlands, around Port Elizabeth, before being allocated to the Germiston Shed.

ST21 – Peter's Predicament.

The chaps got themselves into a predicament with that spanner on what is usually the stoker's exhaust line (in 'forward gear') In the limited space that was available, they hammered the spanner down to tighten that stubbornly leaky union but then realized that they couldn't get the spanner out again. And the stoker's cylinders were in the way of using a mallet or a simple cheater bar to lever the spanner upwards.

Been dying to use this one for ages … we had a spanner in the works! ☺ (Just above the red stoker cylinders.)

The 15F's were built in 6 batches and from the third batch on (the first North British batch), they were fitted with mechanical stokers. The stokers are a Standard Stoker Company type and were built under a UK license by the good ol' North British Locomotive Works. The original design is by the Standard Stoker Company of USA.

ST22 – Saki stands ready with cheat pipe.

Up periscope! Saki Kekana stands calmly and ready with a scrounged cheater bar while Peter and his assistants continue cursing and grunting at their predicament in the stoker compartment.

In the background is the 60 ton Crowans Sheldon Steam Crane recently rescued from scrapping by Sandstone Estates (with the cooperation of REKLAM) and brought to be stored in safety at Reefsteamers. The crane is mechanically 100% complete and awaits boiler work. In amongst the rescued spares, a spare boiler was supplied.

ST23 - The mechanical stoker is started.

The stoker is fired up, not only to test the stoker but to get the spread but thin fire thickened up for the coming safety valve checks. There are three steam discharges here.

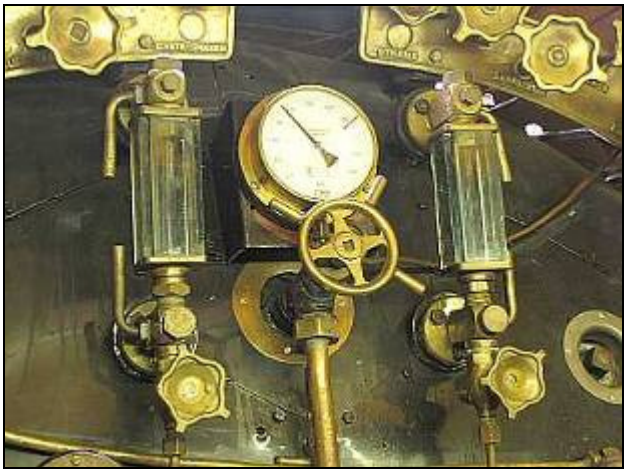
The lower discharge in the steam exhaust and that's cool (metaphorically speaking) … it is meant to be there. The water trap is working. It discharged a lot of condensate during the first aborted test so there isn't much left.

However, the pipe union still leaks. Sometimes you can't solve a leak by extra tightening if the end of the pipe is damaged or if the union itself is grooved. In fact, it is quite possible to split a pipe union by over tightening.

ST24 – A bit o' coal.

If the dusty diamonds are this low on the main line you had better be getting close to home. There wasn't that much coal in the tender – just a bit to get the locomotive into steam and then enough to hold the boiler steady for about 3 hours, bearing in mind that we would waste some of the coal by driving the boiler above and below the pop-off points for the safety valves.

This coal was borrowed from the coal bunker of Dave Shepherd's Class 15F No.3052 – a gesture of friendship form one mechanically stoked 15F to another. It was transferred between locomotives by means of the hydraulic coal grab wagon.



ST25 – Rising Pressure!

The seconds are bloating and wobbling heavily past. The time has ticked to the on the heavy end of 2pm and the steam pressure has only risen 780kPa. But the fire had only just been stoked and was running with very little blower. The motley crew had enough on their hands without driving the boiler to full pressure as soon as possible. Water is 2/3 up.

That prominent spoked wheel valve just under the pressure gauge is the 'scum valve.' It leads to an upward pointing open-ended pipe just inside the firebox rear wall. The pipe is roughly ½ to ¾ of a gauge glass high. It is designed so that when this valve is opened, it forcibly drains off the TOP of the water, presumably with the foam and scum and deep boilered rubber ducks on top of that.

The pair of blow down valves, of course, drains the water from the very lowest part of the boiler, being the foundation, or 'mud' ring at the base of the firebox. The blow downs are designed to eliminate the gradual collection of particles, like sand and dislodged scale, that sink to the bottom of the boiler. Unlike the blow down valves, however, you cannot drain the boiler dry with the scum valve. It will always leave a good few inches of water above the crown sheet. The scum valve is rarely used in our running with our current potable-grade water quality. Excess scum in the boiler leads to foaming and subsequent possible carry-over of the foam into the dry pipe and a priming condition in the cylinders.

ST26 – Four men and a stoker.

The stoker is running but it's a bit sluggish and slow to respond. It is causing some anxiety in the cab and we are but a few seconds form some frantic arm waving. What these fellows forgot is that the stoker's archimedean screw takes some time to fill up completely with captured coal and lift it up to the spreader plate just inside the firebox doors. The mechanically stoked Class 15F has a very steep incline on the third and final section of the stoker 'worm'. The short ascending section climbs a 45 degree angle.

From left to right in the cab, Attie de Necker (On the phone), Saki Kekana, a curious Stewart Currie and just visible, Peter Labuscagne.

ST27 – Stoker Reverse lever.

A rarely noticed feature on these locomotives is the 'L' shaped lever protruding on the left side of the shovel plate. It is the lever that operates the change-over valve that supplies the stoker. There is no mechanical shifting of the stoker engine's valves as is the case of the valves in the loco's steam chest. Rather, the connections of the steam supply and the exhaust are switched over. The stoker engine's valve timing is a fixed 'event' and is driven by eccentrics from the crank shaft.

The stoker is reversed in operation should a foreign body like, say, a house brick, land up on the coal and jam within the trough. You'd be surprised and horrified in equal amounts what junk lands in coal piles sometimes – or even in the coal as delivered from the mine's trucks!

ST28 – Stoker Controls.

Perhaps some of the most complicated looking pipe work on a modern steam locomotive, the mechanical stoker controls. Like on most surviving locomotives, the center of the five blower jet valves, meant for 'fine coal' is disconnected and there are only four pipes routed under the five finely-spindled jet regulator valves.

Apart from the one already mentioned union on the bypass valve's converging tee, all of the many unions seen here, from the green 'pan-handled' stoker jet valve, through the manifold and the 5 jet regulator valves were leak free. There was a pinhole leak on one of the brazed stoker jet pipes though.

The medium sized valve just to the left of the five babies is the local shut-off for the grate shaker's changeover valve.

ST29 – Stoker Exhaust.

The four gudgeons eventually got the stoker to run and get that fire built up to get the boiler to full pressure. There is little breeze today and the stoker engine's downward pointing exhaust drifts slowly back and obscures the massive triple-axle tender bogie and fills in the form of the brake system.

The brakes had been roughly adjusted and the cylinders inspected under the tender, hence that forgotten inspection lamp. However, due to problems within the ejector, as well as various leaks on the vacuum side, the brake system wasn't working.

ST30 – Tender view of the atmospheric action.

Yeah … there's a lot going on here visible from my vantage point, safely on the flat plates behind the angled coal hopper. They've finally stopped fussing with the stoker and are letting it run, hence the roiling smoke column out from behind the gantry crane's rails. But even that vevusian cloud is being obscured by the ever growing steam leak at the dome.

Three of the safely valves eventually leaked after they had popped off and closed once, but in this early picture., they are completely featherless as the steam pressure rises for the first time.

ST31 – Peter 'Lappies' Labuscagne.

Peter was trained as an apprentice at the depot when he was a frisky skirt-chasing young lad. Did he ever think he'd be back at the same more than 40 years later and still working on steam powered clankers? He has shared many interesting anecdotes on his early day at the Germiston Depot and what it was actually like back then.

ST32 – Front end view without Smoke Deflectors.

Even just viewing the front part of this impressive machine gives an impression of power and of the sheer presence of all that vibrant steel. The front end is to be repainted in a black etch-primer coat – no silver paint and very definitely NO GRAPHITE! This locomotive is going to look a picture painted all over black and with the minimum of flashy ornamentation.

We were planning for many years to run this locomotive without smoke deflectors, hence the lack of the mounting hardware. Just above the horizontal hand rail, you can see the two oxide primer spots where the top deflector brackets would have been attached. You can clearly see the modified 19D hand rail on the walkway riser, although this particular rail had already snapped off from the lower mounting.

However, the Rail Safety Regulator has objected to our decision and so we will be adding the original dun-green smoke deflectors after all – resurfaced and painted gloss black, of course. We were hoping to run this engine completely visually backdated to the first batch of Class 15Fs from 1938, which ran with the barrel headlamp and no deflectors. We were also hoping to be able to double-head this engine with one of the other 15F's, typically Dave Shepherd's No.3052 'Avril', for an interesting contrast in styles. And she would have blended in better with the deflector-less locomotives such as the 15CA No.2056 'Dorothy' and the 12AR No.1535 'Susan.' Oh well…
The original Class 15F's were prone to smoke obscuring the driver's vision, so the RSR do have a valid point.

ST33 – Andrew gets ready to calibrate safeties.

With his lugs safely covered up, Andrew King awaits for Mt. Ross to erupt. This exercise would be one of increasing the boiler pressure, noticing when the four individual safety valves open and adjusting the spring tension accordingly. The boiler would then be allowed to cool down and the valve closure action checked. And the cycle begins anew until the particular valve is correctly set. Andrew was working on two of the four valves at a time.

Out of frame to the left, Boiler Inspector Davie Olivier is sitting on the top tool shelf and relaying instructions to Saki Kekana, who is adjusting the boiler's heating accordingly.

The safety valve under a plume of steam in the picture has not lifted yet – that's just a 'feather' of steam.

ST34 – Leaking Washout Plug.

One of the requirements for the early London underground was that the locomotives 'consume their own smoke and steam.' They were built as side-tank condensers. Well here, No.3046 is 'consuming' her own steam – the said steam issuing from a leaking wash down plug that was really starting to blow under the red-line boiler pressure. This was the only leaking washout plug in the entire cabin.

Those are Saki's clod-hoppers doing the injector dance to get some water into the boiler and get the pressure under the red line to close the safety valves again. This was the first cycle and he was just discovering that putting-tee valve handle was very stiff to operate and he was overshooting his water settings. The valve itself had over-tight packing.

ST35 – A pair of 'Spoories.'

A pair of old 'Spoories', as us non-railway people call them, are watching the safety valve adjustment from a safe distance. (We call them 'Spoories' after 'Spoornet.') That's Johannes 'Stitch' Versteeg on the left (Workshop Foreman) and Oom (Uncle) Attie de Necker on the right. (Driver.)

It is often funny to watch these guys – they've seen hundred of locomotives under repair and maintenance, and probably dozens of them turned inside out from dismantling, or cut up for scrap, but they are still sitting there, fascinated, and proving that there is something compelling about the elemental drama of man and machine that draws attention.

Behind this twosome is the rear side of the removed smokebox front plate for the Class 12R No.1947 'Rosie. Attie is actually sitting on the done.

ST36 – Oil Discharge.

Freshly steamed chicken soup anyone? The hydrostatic lubricator is working for this cylinder and valve chest anyway, and the delivered compounded steam oil is issuing forth with the condensate water.

The resemblance to cheap chicken broth isn't coincidental – this oil is compounded with animal fat (usually chicken but sometimes pork) so it can create a usable lubricating film under high pressure and high speed steam application.

This condensate is nasty stuff to step in as it can be hot and really puts the skids even under supposedly oil resistant safety boots.

Apart from Sandstone's GMAM Garratt, this is the only locomotive in our fleet to have those seriously blingy chrome plated cylinder covers.

ST37 – The first blow off.

The-e-e - first - blow-well-l-l, the-e - engine - did – make!

At about 3:15pm, the first of the four safeties were allowed to lift and the calibration could start in earnest.

Fortunately for James Thomson's 'beloved' pigeons, which do such a good job of 'decorating' his lathe and associated machinery, this steam was blasting out into the open air rather than amongst the black and sooty rafters of the workshop.

ST38 – Adjusting the safeties.

A Ross Pop concerto in steam-minor.

Andrew King gets a steam facial as he starts the adjustment process. The long reach square-sectioned socket is clearly visible through the steam. On a four valve boiler like this one, the back valves, if they lift, are normally closed first and the two front valves are then adjusted to open. Here you can see both the front valves are blowing.

The reason is that the valves are set to lift in a one-by-one sequence to better match the actual rate of increase of boiler pressure – rather than all four valves lifting at once. If the rear valves are set to lift first – one then has to work through the jets of steam to adjust the two front valves.

ST39 – Safety Valve Settings.

The steam leak at the dome obscures the action as Andrew nips up the tension on the helical spring on the left rear safety valve. He can see well enough – but can't put his face in amongst the steam, so this is awkward arm's length work while balanced on haunches on top of a circular boiler shell. And it steams the facial black-heads right off!

The safety valves are adjusted by removing their nuts and the bonnet, and then adjusting the length of the compressed spring to set the tension. The higher the spring tension, the higher the pressure in the boiler before that particular valve is lifted.

ST40 – Blow down!

As we normally do, the fire was originally lit up with the water glasses at ¼ full – and the water expanded to more than ½ glass when we had boiled the hippo. However, it was inevitable that the extra water space would be used up by cycling the boiler to the red line and under again, intermittently injecting water to lower the steam pressure.

So the blow downs now come into play with roaring jets of steam and a film of rust scented condensation on everything in the vicinity!

ST41 – Tamper Proofing.

Here are the anti-tamper cages ('Bonnets') for the safety valves. When they are in place they shroud and block off access to the spring collar and the square profile shank used to adjust the spring tension.

These 'bonnets' are then tightened down and then pinned. The pins are then wired in place and then sealed by the official boiler inspector with a lead compound or an epoxy tag. Thus, they cannot be adjusted without breaking that wire. A locomotive found with a broken or cut cage wire should be withdrawn from service.

There are incidents throughout the steam age of operators eking out some extra power from their boilers (not necessary steam locomotives) by screwing down the safety valves – and the occasional boiler explosion bears testimony to the danger of the practice.

ST42 – Peter takes notes

With most of the locomotive's problems having revealed themselves with a belly full of steam, Peter Labuscagne starts writing the faults and adjustments required in a work list for later attention. As pointed out already, no matter how well you have fitted pipes together, or assembled safety valves (in this instance) or assembled valve packing, apart from more complicated operations – it is impossible to say for sure it will work until put under steam.

Peter didn't say much and I couldn't figure out if he was disappointed or pleased.

Blurred in the background, Saki Kekana is having his own problems trying to get the injector to pick-up. The foot operated water valve is still over-stiff, and there turned out to be too much slack in the linkages that operate the Sellar's valve.

ST43 – Blow Downs won't close.

The lifting settings could be adjusted properly but three of the four safety valves wouldn't close properly after the first test cycle. You can see 3 steamy 'feathers' in this photo.

Patented by R L Ross in 1904, the Ross Pop valve has an inverted tapered top hat section on the valve element. The smaller face is the section that initially lifts under steam pressure as calibrated by the spring. When the valve element starts to lift, the upper wider section is then exposed to the steam pressure. Because force = pressure x area, the upwards force on the valve suddenly increases to an extent greater than that of the spring. The effect is that the valve 'pops' open and then stays open. The valve stays open because the increased force on the wider part of the element is greater than that which originally opened the valve. The chamber in which the valve element operates is called the 'Huddling' chamber.

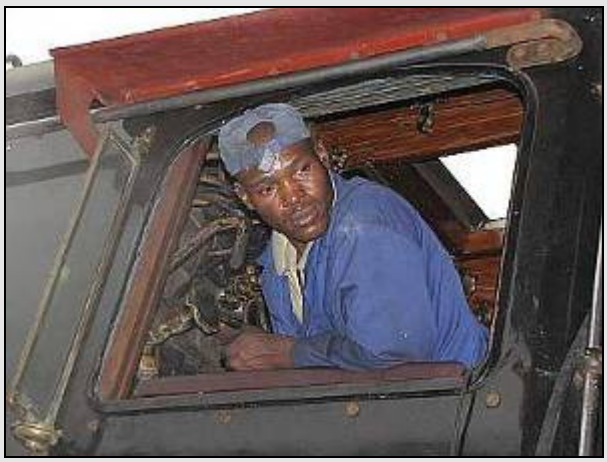
However, when the force of the steam pressure on the larger face of the valve element has diminished enough for it to begin closing, when the larger area is shielded off from the steam pressure, the valve 'huddles' – it snaps completely closed under the regulating pressure of the spring. For, by now, the steam pressure is too low to lift the valve via the primary, smaller face on the valve element. The difference in surface area and thus imparted force in proportion to steam pressure is what provides the desired hysteresis in the valve cycle.

The older valves tended to open slowly, wasting steam. They were also slow to respond and would often only open sufficiently to discharge enough steam when the boiler had already exceeded maximum operating pressure. 'Pop valve', including the Ross Pops here, are designed to be completely closed or completely open – the bores and passages of the SET of valves being selected to discharge steam to match the maximum steam raising capacity of the boiler.

Unfortunately, the closure cycle cannot be independently set from the opening cycle as the same spring is used and the duty cycle is determined by the dual proportions of the valve element itself. A mechanical fault cannot be adjusted out and indeed, no attempt should be made to do so.

ST44 – Victor tweaks the Sellar's valve.

Victor Zwane gets out on the walkway and starts tightening bolts on the Sellar's valve cradle. He's using an adjustable spanner though and those jaws were slipping, as they often do on those old and rounded nuts….



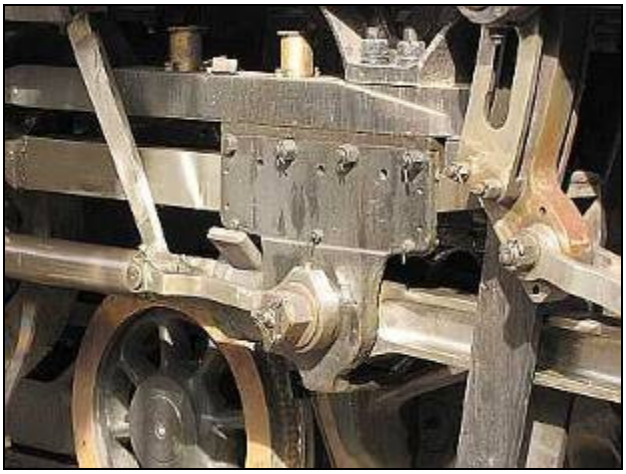
ST45 – Saki looks happier.

Fireman Saki Kekana looks a bit happier as he checks the injector's overflow pipe while modulating the water flow.

One on the weakness of Reefsteamers, indeed, most of the steam clubs in this country, is that most steam enthusiasts and the club members themselves are of European ethnicity rather than African. It is not by a deliberate policy of racial exclusion, but merely because of demographics.

ST46 – Sunny afternoon.

The sun has finally come out and the shadows are getting longer at about 3:30 pm and everyone's attention on is the safety valve adjustment and optimization of that left injector.



ST47 – Crosshead Detail

Here is the left-side cross head highlighted by the brief spurt of afternoon sunlight. Although the motion looks a bit dull and oxidized from long disuse, it has been completely rebuilt. The piston is almost completely at back dead center. It all looks a bit dry and one of the minor jobs on the issues list is that all the oil pots need to have wicks re-fitted.

ST48 – Boiler Inspector.

Things have quietened down a bit in the belly of the beast and both Andrew King and Dawie Olivier are looking at those safety valves. Although the valves were lifting OK at the preset pressures, they weren't closing properly.

Although Mr. Olivier is quite strict, he is also very supportive of our efforts at preservation. In fact, we appreciate that strictness, as these boilers are getting increasingly elderly and need ever more careful checking.

It IS heart breaking have a locomotive pulled out of service, like our 15F No.3016, for thinned-out plates or a similar fault. But it would be a lot worse to have a catastrophic failure on the line, possibly hurting or killing someone, quite apart from serious damage to the engine. With pressures of 12 to 14 tons per square centimeter, you don't play around with these old boilers!

ST49 – Lets have another go.

As the brief afternoon sun is obscured by the clouds again, the loco makes her own moisture laden clouds for the penultimate blow down of the day.

This cloud of steam looks impressive but the blow down valve is actually only partially open. You should see (and hear) these beasties when they really let rip!

ST50 – Ok, bring her up again! (Sigh…)

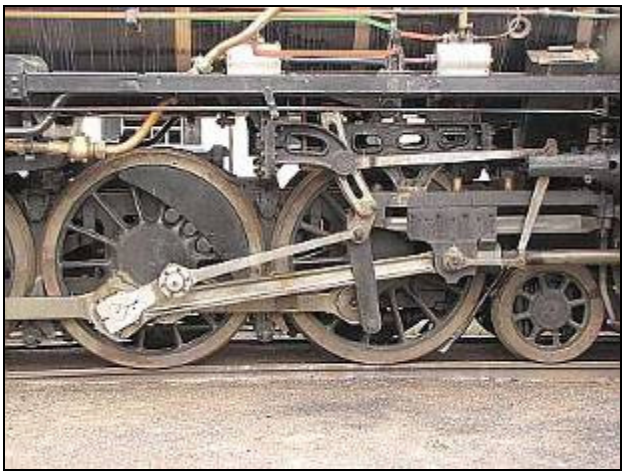
ST51 – Diesel in the bushes.

Actually, just hiding coyly behind the bushes on the curved head shunt for the 15M yard. That's enough for the day and it is time to pull the newly awakened 15F into the clear to drop her fires and to let her 'hiss down' and cool off.

ST52 – Out you come!

The tough little Hunslet Taylor, only 7 years younger than the steamer that he is pulling out, takes up the slack and pulls the 108 ton locomotive slowly out through the gates. Saki Kekana is driving (like beach sand, he gets in everywhere!) and Oom Attie is conducting the shunt.

The fellows were all careful to check for scotch blocks, hoses and electrical wires and to remove the rolling scaffolds and steps. There were no little oopsies pulling this hunk of rolling steel away from the launch gantries.

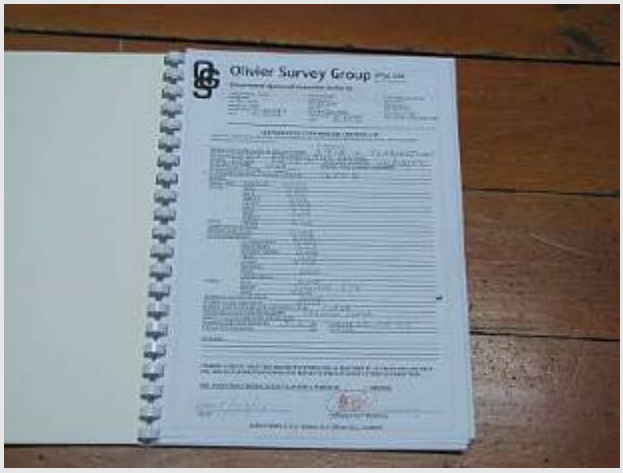


ST53 – Valve Motion.

What could be more graceful than watching Uncle Emile Walshearts' valve gear moving at less than walking speed?

Although the fitting crew didn't bother with painting or stripping the rims on the driver wheels, having far more important things to do – they did eventually take time out to polish the coupling rods and valve motion. Being bare steel, they rust quickly if in a dry state in the steamy and somewhat acidic atmosphere of a steam shed.

Notice the extra counter-weighting between the spokes of the driver axle. (left)



ST54 – Boiler certificate.

Here is what this exercise is all about – the coveted boiler certificate. The certificate forms the front page of a booklet with all the required information of the locomotive.

This one, unfortunately, is not for No.3046. It is a previously filled in certificate for hand-bomber 15F No.2914 'Spikkels.' No.3046 has passed her inspection but will not receive a certificate until the safety valves are sorted and their re-calibration is witnessed.

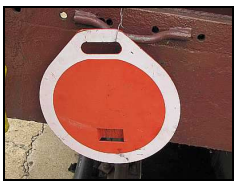
Other issues, such as the blown gasket on the reverser and the brake ejector problem are Andrew King's babies – but these are also signed for on the train operating forms and the locomotive inspection sheets.

ST55 – Pulled out for fire cleaning.

Class 15F No.3046 looks a picture being carefully pulled out amongst the clinkery back-end-of-the-moon wasteland outside the 15M sheds. It would have been sweet and poignant to have been able to say that the locomotive moved under her own power but, unfortunately not. The reverser's power valve gaskets had blown and we had no heavy weight graphite Klingerite to replace it. The brakes didn't have enough suction to lip up a wine-gum. So the locomotive would have been dangerous to move although she could have easily run under her own power if the regulator was reconnected. It would have just been the stopping that would have been the problem!

She had one more surprise for us – the grate shaker doesn't work! The actuator cylinders power up and clench the linkage but the grates themselves are jammed. Some of them weren't installed properly and are too close together – their corners fouling with their neighbours when the grates start to rotate. So the fire had to be raked out completely by hand.

It was close on 4:30 by this time, and most of the spectators had done a ghost in an attempt to beat the worst of the Friday Afternoon traffic jams. So the last action on this day of testing, and the last shunting move back into the workshop bay was made in relative obscurity.



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