Introduction :

FP01 – Fixing the parts to enjoy the whole. (A very big "whole") The leading engine unit of the Sandstone Heritage Trust's GMAM Garratt No.4079 "Lyndie Lou" oversees and approves of the Saturday Bissel Truck assembly project.

It seems that we only get partial photos of this locomotive with a bunker, chrome plated cylinder\valve chest covers and buffer beam coyly peeking out from the workshop. However, this machine is so long and the shed a bit dark for wide angle photography that it's quite hard to get the entire locomotive into one picture. She still looks impressive, and the reflections from the rounded nose show off the shiny green paintwork very effectively.

We were hoping to get this locomotive in steam on Saturday 15th December for a good old fashioned shake-down run, pick up the parts that fall off, and then do an official revenue earning run to Magaliesburg on the 17th December. (SANRASM Museum Train to Magaliesburg) However, the unexpected poor condition of the Bissel Axle bearings has been a problem, as these bearings are expensive and hard to find. The dismantled Stoker Motor had some amusing surprises for us as well and has caused some contemptuous comments towards the unknown "fitter" that put the Stoker Motor together. No wonder the poor device was barely able to run.

Our Class 15CA No.2056 "Dorothy" will be taking over this weekend's runs. However the delay means we get to do an even more thorough overhaul on the Stoker Motor and perhaps some more detailing on the engine itself.

However it has been a day of progress and enjoyable trying to figure things out. In the meantime, our coaches are being inspected end-to-end for cleaning requirements and a cosmetic refit. The coaches are basically intact and functional but are getting a little scruffy inside. Some of the floors need attention, particularly in the crew and guard's compartment of the Power Car. With the extra four coaches recently retrieved from Ficksburg, (Where they were stored by the Sandstone Heritage Trust), we can now make plans to get one or two of them ready for mainline service and then pull some of the original Reefsteamers mainline coaches out of service for a seriously good fettling. The Wehmeyer Bros. seem to be fast becoming the Coaching Caretakers.

The Reefsteamers Class 15CA No.2056 "Dorothy" got some post run attention after her Friday run – the usual fixing of the minor snags and problems that are an integral part of running engines as watching the boiler water level is. The fireman's side window had to be replaced as the train was stoned on Friday – but fortunately no humans were hurt.

PROJECT – Assembling the Trailing Bissel Truck :

FP02 – Comparison. The original rear engine unit's Bissel frame in front of the original front Bissel's frame undergoing assembly. Once the GMAM Garratt is running again, we'll clean this frame and free up the seized Bolster Plate before putting it into storage.

We had two separate teams working on the gritty concrete of the Workshop Yard ; one team assembling the Bissel Truck itself, with another team stripping and checking
the axle in hope of re-using the axle bearings. A third team member was James Thomson, who was busy in the "Top Shed", fabricating brand new countersunk bolts for the
Vesconite slide bearings. We enjoyed a blessedly cool day under bruised, overcast skies – but that proved to be a mixed blessing when we got rained out in the early evening.

There are actually three GMAM Garratt Bissel Trucks on the site. The Bissel Truck that was provided as a spare (Which I call the "Donor" Bissel Truck) is now under the front
GMAM engine unit, with the donor's axle and a new pair of bearings at one axle end. The original front engine unit's Bissel Truck Frame is the one upon which we were working
on today, to be matched with the axle of the rear engine unit's Bissel and to be mounted onto the rear engine unit. The original leading axle is lying out of use with damaged
bearings and badly worn wheel flanges on the LHS. The frame of the rear engine unit's Bissel Truck, which was removed two weeks ago, is now lying between the tracks as
storage. This has turned out to be a bit of a mix and match project with the consequent issues of transplanted parts not fitting as expected. Musical Bissels anyone?

Now that all potential confusion has been eliminated, (Yeah right) on with the show!

The Bissel Truck assembly started with the removal of the original steel-plate slide bearing rivets. These are round headed rivets which offer little mechanical purchase.
They could have been chiseled off after much laboursome whacking, but our experienced Bissel Boys went straight for the acetylene option. (Pic B01 below)
The original bolster slide plates are plate steel and are held on by eight rivets each, in two rows of four, with the outer rivet head a classic half-sphere, and the internal heads ground off flush against the bearing surfaces. The original Bolster Plate installation has its own strip bearing on either side, and it contacts the two slide plates above the top row of rivets. The end pins and the connecting bars of the swing links likewise contact the slide plates in between the two rows of rivets.

The removal of the rivets and the original rusted slide bearings went without trouble and it wasn't long between the pneumatic descaling tool was in use. (Pic B03 below) This work was very necessary as there was much corrosion revealed when the slide bearings had their rivets removed and were punched out. The expansion effect of the corrosion behind the slide plates is the crux of the problem with these Bissel Trucks, as it pushed the two plates inwards, reducing the clearances and literally pinching the Bolster Plate within the effectively narrower frames. (Pic B02 below) The frame was given a good (and rather noisy) cleaning inside and out, with special attention to the crevices, the old rivet holes and the swing link bearing pads. Dawie Viljoen would have done a dentist proud, meticulously going for all the crevices and the gaps.

B01 – Shaun Ackerman ("Smudge") tackles the first row of rusty rivets holding the original plate type bolster slide bearings in place. That acetylene torch was in use for Bissel and Axle work throughout the entire day!

B02 – The rather crusty interior of the Bissel Frame with one slide plate (top) removed and the lower slide plate still in place. Notice all that corrosion evident where the top plate was. You can see how the lower plate is distorted and pushed inwards at the top edge.

B03 – A close up of the pneumatic descaling tool which Dawie and Shaun used in turn. (The vibration gets to be too much after a while.) Notice the metal shavings on the lower flange lip and the ground, the remnants of torched rivets.

The next step was the removal of the original slide plates and setting them up as a drill guide with the two new blank Vesconite plates – obviously cleaning them up a bit first. (Pic B04 below) Care was taken to make sure that the holes actually matched in both plates (by stacking them and checking that the holes overlapped) and then making sure that they were centralized on the Vesconite Plates as the Vesconite is actually longer than the original steel. The heavy duty self-feeding radial arm drill was used with both coarse and fine feed settings used carefully.

Once the 8 holes were bored through the plates, the Vesconite sandwich was dismantled and one sheet of 16mm thick Hi-Lube Vesconite inserted between the clamps. An even larger drill bit was used – the fluted end to act as a crude but effective countersinking tool.
(Pic B05 below) It was easy to match the diameter – but each hole had to be carefully tested with the inverted head of a countersunk bolt to make sure that the final bolt head fitting would truly be below the bearing surface. Otherwise the bolts would scrape against the sliding bolster plate or the swing link bars – defeating the entire purpose of the Bissel Truck overhaul. Drilling and test fitting each hole was a tedious and finicky affair, traversing and rotating the cumbersome drill. The guys switched over to manual feed for this operation.

B04 – The two new blank Vesconite plates clamped with one of the original slide plates as a template for drilling.

B05 – A close up of a newly drilled countersunk hole next to a standard bore. This is actually much cleaner than it should be, as the characteristic very long curly Vesconite shavings have been removed.

B06 – The Countersinking Keys are being ground off the bearing bolts on the large grinder. You get an idea of the size of this machine by looking at the scale of the hands and the grinding wheel.

Two batches of countersunk bolts were used to get this Bissel Truck back together. The first set of eight bolts was supplied with integral locking keys under the angled face of the head. The second set of eight bolts were fabricated on site by our James Thomson, across the shed in the "Lathe Cave".

The original idea was for the locking key to embedded into the Vesconite material, cutting its own slot and locking the bolt while the nuts are

being tightened up. In practice, this has proven to be useless, as the bolts still need to be jacked in right up to molecular squeak level to stop them from turning and there's the risk of scraping away the countersunk hole. Shaun had the delightful task of grinding away those keys on the monster sized grinder. (Pic B06 above)

James was turning and threading a set of eight brand new bolts in the "Lathe Cave" at the back of the upper shed. (Pic B07 below) Meanwhile, back at the Bissel Building site, Fred Sewell was exercising his wrists by polishing up the moving components of the Bissel, comprising of the swing links, the connecting bars and the four radius ramps under the Bolster Plates. (Pic B08 below) All these surfaces were roughly cleaned up several weeks ago, but as the parts have been standing around, they've become dull and a little oxidized.

B07 – A row of newly fabricated countersunk slide bearing bolts stand to attention behind the fallen original bolt used as a sample.

Notice the radial moiré patterns on the turned down heads instead of the flat reflections of a typical stamped bolt head.

B08 – The useful emery flap grinding wheel used to polish up the working faces of the swing links, the radius ramps and bearing surfaces of the sliding Bolster Plate.

B09 – The unusual geometry of the swing links (Upside down) ensures that the Bolster Plate is supported at the same height whether the locomotive is on a curve or a straight track. They are ingeniously designed so that when they are tilted at an angle, the circular lobes on the underside engage and jack up the quadrant to make up the height that would be lost in the diagonal movement.

Fred "Sparky" Sewell had some "fun" trying to get the two strip bearings off from the long sides of the Bolster Plate. He didn't have a proper grinder disk on him – although the emery flap wheel was useful for grinding off residual corrosion. The plates had to be levered off, with a combination of two crow bars and some wedges – and Fred almost tested his safety shoes when the plate fell over under the leverage. The strip bearing was originally meant to protect the casting of the Bolster Plate and to slide on the slide bearing plates of the same material. This is not necessary with the Vesconite. These overhauled Bissel Trucks thus have fewer crevices.

Simultaneously, Piet "Buffels" Steenkamp was painting the Bissel Frame – so this big piece of locomotive had two people working on the axle, one painter, two drillers, one machinist and one whacker. The primer had settled within the paint tin. Fred Sewell started the painting process but the paint didn't spread too well. Piet, in his green "Site Manager" hard hat, mixed up a fresh tin of primer. He was being a bit of a "skelm" (Sneak – for the Brits) , as his official job was to help Oom Attie de Necker sanding off the paint from the locomotive's pipe, brass and copper work. Ultimately, the Bissel Frame received two coatings of primer.

B10 – Fred Sewell is levering off the two strip bearing plates from the Bolster plate. (Upside down) This pic also shows the ramps in the corners that engage the large quadrants of the swing links

B11 – The Bissel works. (Albeit upside down) Here you see the swing links, connecting bars and the bolster plate assembled as they would have been within the Bissel Frame.

B12 – The Bissel Frame is painted. Piet "Buffels" Steenkamp stirs up the primer by rocking the tin on the "Komati" box.

The freshly drilled and countersunk (and greasy finger printed) Vesconite Plates were brought across to the Bissel Truck and installation proceeded. All the holes lined up pretty well except for one.

We first needed to rig up a jack and a spacer block to span the frame cavity – using the jack to push the bolts all the way home and hold them tight so we could attach the nuts. Remember that those countersunk heads inconveniently have no features whatsoever and cannot be gripped. We've been tidying up the place recently and had a few wasted minutes looking for suitable wood blocks – which normally lie around like acorns under an autumn oak tree. We couldn't find any suitable convenient blocks as the nice sized ones just happen to be in use to hold up the rear engine unit of the GMAM. We discovered that a span bolt sleeve makes a great spacer. (Pic B14 below) Considering its normal; role under the axles, it's not too inappropriate a job either. Fred "Sparky" Swell and Shaun "Smudge" Ackerman aligned the countersunk heads and a nut in-between the bolts and the jack ram. Dawie Viljoen got to do the tightening of the brand new Nylock Nuts and washers, while Lee Gates operated the jack. 5 men on the job. Restoration Safety Tip – It is really not a good idea to put a deaf man in charge of the hydraulics!

B13 – Work threads converge. Piet Steenkamp sneaks in some extra primer paint around the newly fitted but still loose slide bearing nuts while the Bissel boys were looking for jacking components.

B14 – An overhead view of the hydraulic jack and the spacer arrangement – with a span bolt's sleeve in the center. This shot was taken before we used a nut between the hydraulic ran and the bolt – to "drift" the

B15 – Test Fit. The Bolster Plate is hoisted into place between the slide bearings. It fits between the sides of the Bissel Truck frame.

heads below the Vesconite Sheet's surface.

All 16 bolts and brand new Nylock nuts were installed without any fingers getting nipped. The plates cooperated and settled in well under the application pressure with no buckling. We had Piet Steenkamp sneaking in with his paint brush in between the jacking operations. The entire Bissel Truck frame received a cat's lick coat of primer after assembly anyway. We managed to chain up the Bolster plate with the octo chain and get it suspended between the Bissel Frame cavity, now narrower because of the two Vesconite bearings. It was a good fit and we left it suspended in the frame (without swing links) as the evening's rain started up and drove us to start packing our tools and especially the electrical equipment.

We're getting good at this!

PROJECT : Stripping Axle Bearings :

Patrick Ackerman and Andre van Dyk took on the task of removing the axle boxes and inspecting the bearings of the original axle from the rear GMAM Garratt's engine unit's Bissel Truck. The work initially went slowly as Patrick was faced with the laboursome chore of scraping off what looked like decades of encrusted muck from behind the axle boxes and the wheel spokes, while Andre had to make frequent detours into the kitchen where he was cooking a railway lunch for the team. This little two man team worked out under the 5 ton gantry crane, alongside the Bissel Boys : so there was much activity in the workshop yard today.

It was hoped to simply be able to clean and repack the bearings, and to replace the axle in the Bissel Truck that was simultaneously undergoing reassembly : and get the whole kit back under the locomotive on the following day (Sunday)

However, those axle bearings were found to have become spalled, the case hardening beginning to crack : showing characteristic black ines and slightly pitted areas. This leads to flaking. With the case hardening disintegrating, while the softer materials deform when the rollers get pounded under the point loads, the hard chips and fragments mix in with the grease and pound the rollers : accelerating bearing wear. Rolling bearing wear is exponential : the rate of destruction increasing over time.

We really weren't happy having to condemn this set of bearings, especially as we have no spares. Safety dictates that the bearings be in top shape for a Bissel Truck : especially on a symmetrical double-ended locomotive such as a Garratt, where a trailing Bissel Truck could just as easily become a leading unit at mainline speeds. Nevertheless, the Reefsteamers' focus on engineering excellence, as per our motto, means that we weren't going to bodge this job. We could have gotten away with just stuffing the axle boxes full of grease and running the engine on suspect bearings.

This problem means that we need to procure and purchase bearings during the week and can only fit the axle on a week night : although some of the Bissel Boys might be able to get off work and do the axle refit during the day. However, this was one of the problems that hindered progress during the weekend. We also had a pair of axle horn bearings disappear from Oom Attie's locker. (Post edit : The test run has been delayed so we'll spend another weekend on this project. Shaun Ackerman is sourcing axle bearings on the day of posting - 12 Dec.)

The axle bearing work started with the removal of the axle boxes. (Pic A01 below) These are unbolted from their back plates with eight nuts and simply pull off longitudinally along the axle shaft end. It's not as easy as it sounds as the bolts are literally buried under literally years of dirt, as they aren't even all that accessible even with the locomotive on an inspection pit. So, the bearing work started with much scraping of dirt in-between the axle boxes and the wheels. On a removed axle, the axle boxes can just spin freely on the axle end. Thus, the box needs to be wedged and held down so it doesn't just spin on the axle when the bearings are exposed.

A01 : Patrick Ackerman is scraping off an axle box back end. The axle box lays seal end upwards in front. Notice that two of the studs got left behind in the back plate. The blocks of wood were used to stop the box from turning. On top of the wood are the semi-circular intercostal spacers for the two outer bearing races.

A02 : A high pressure water wash in action. Care was taken not to over spin the bearings although the drag of the displaced outer races acted as a brake anyway. The bearings would later be washed with a mixture of degreaser and diesel fuel.

A03 : A freshly water-cleaned bearing glistens under the oily droplets. Notice the almost horizontal split pin holding the castellated retaining ring in place.

The two silvery rings on the outside are the outer bearing races, and the darker notched ring at the back is integral with the backing plate, and acts as a combination spacer, thrust plate and axle grease seal retainer.

The removal of the axle boxes went with little trouble although some of the studs got stuck in their nuts. The half-round intercostal spacers came out with little difficult and the grease was removed with some black finger work and rags. It's a messy job, but functions as a first analysis tool : feeling for grit and metal particles in the grease. The grease on both ends was found to be reasonably clean.

The bearings were then cleaned with rags and the grease within the boxes was scooped out. Then it was time for a high pressure cold water wash. (Pic A02 above) It may seem counter intuitive to wash a bearing out with water : but this is simply an economical way to physically blast grease from the bearing cavities and races. We were using the brute hydraulic force of the water rather than chemical action of solvents and degreasers. This was a rinse-and-repeat operation : the bearings getting blasted and then turned to expose new surface. Even though a light film of the grease remained, (Pic A03 above), the bearings could be inspected under the scattered water droplets.

It didn't look too bad, so Andre and Patrick continued setting up the spray gun to apply the degreaser \ diesel mix as pre-prepared by Piet Steenkamp. It looked like weak antifreeze. The degreaser would strip the remainder of the grease, while the diesel would serve to do the same, but also to help clean up the water as diesel fuel is hygroscopic.

A04 – Degreaser and diesel mixture being applied to the bearings. The air gun had a small capacity and needed frequent topping up – but the compact wand could be aimed directly into the cavities. Notice the catch container to catch the dribbles.

A05 – One of the axle boxes gets a high pressure water spray before degreasing. Notice that Patrick is standing well back in case of high pressure grease laden back-spray.

A06 – You can actually read the text and see the original primer coat on the bearing end cover

With the degreasing done, not forgetting the axle boxes (Pic A05 above), the intercostal spacers and the classic old Timken bearing covers (Pic A06 above), closer inspection of the bearings could now take place. The bearings at both ends of the axle displayed evidence of spalling – the case hardened layer beginning to break up – and one of the bearings was found to have some mild chipping starting in the rollers. As inconvenient as it is for our tight schedule, the axle bearings were condemned and made ready for removal.

This meant some entertaining grunt work in getting the split pin off the castellated retaining ring and then trying to remove the ring itself. No doubt the Railways had some sort of tool that enclosed the retaining ring and engaged with the slots, and allowed for the application of leverage. We had to make do with a drift. We tried initially with a hand drift, and eventually with a wedge held in the handle of an old spade. (Which is better not photographed.) We wanted to have the guys standing well clear of the mallet stroke. Eventually the retaining ring had to be heated, and evenly too, for these would have to be reused. It was a right royal battle to get them off and some of the castellated slots got damaged. It has been seriously suggested that we design and fabricate a tool to perform this job, especially when our coach bearings start requiring attention.

A07 – The first attempt to get the castellated retainer ring off. We were very wary of the possibility of hurting someone in this operation.

A08 – A tripod bearing puller takes the strain. Notice the nuts wedged behind the arms to keep the claws straight. The bearings still had to be tapped and the inner races heated to get them off.

A09 – Inelegant defeat – using a torch to cut up a bearing after it cannot be withdrawn from the shaft. The flames are from the residual degreaser and diesel fuel that has ignited.

The bearings themselves weren't much easier to get off and it was amazing how much they were able to resist the enormous traction that we had applied. A tripodal bearing puller was applied but was unable to grip properly due to the diameter of the bearing. Hex nuts were used to wedge the arms away from the center frame and thus line up the claws for a better grip. (Pic A08 above) The puller alone was unable to do the job. We cycled between heating the inner bearing race with the acetylene torch in an attempt to expand it, and trying to jar the bearing free with a copper hammer applied to the center bolt of the puller.

That was one bearing off and the spacers and inner bearings came out with a combination of drifted wedges and heating. (The puller being too shallow for the shaft.) The bearings on the other axle end point blank refused to move and we resorted to cutting the bearings up in situ. (Pic A09 above) Evening was falling by this time, hence the dark photo. The residual degreaser and diesel fuel ignited during the cutting operation and made a dramatic display of sputtering flames.

A bit of chisel and hammer work in the heated sections cut the bearings up amongst a scatter of rollers.

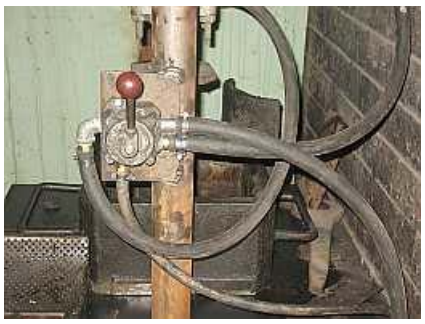
So we are now four bearings short of an axle. Sigh.

Project – Axle Pad Grease Press :

We are slowly improving our facility. It's time consuming, but we have the luxury of doing this in little steps as we have enough locomotives to cycle between running and repairs. However, this particular job has become a more urgent project necessitated by the fact that we're running low on fresh locomotive axle grease pads. These are simply not optional, hence the order of work.

The Axle Pad Grease Press was completed and tested for the first time today. The machine accepts the extruded block of grease,and presses them into a rectangular mould. This grease is very stiff – it has to be, to hydrodynamically bear the weight of a locomotive within the axle bearings. On top of the grease block is mounted a perforated semi-circular profile plate that matches standard axle journal diameters. Then a matching semi-circular shaped dolly is inserted within the concave surface. The pressure of the ram presses the semi-circular plate into the block of grease – the plate's shape being backed up by the dolly block. The grease is meant to ooze through and protrude through the perforations.

The pressure is then released and the grease gate below the mould is opened. This allows the newly pressed axle grease pad to drop through the hatch into the catch frame below. It usually needs a bit of persuasion with the ram depending on the consistency of the grease. The dropped pad preserves its shape and can either be used straight away, or wrapped in grease-paper and stored for future use.



P01 – The newly installed grease press pneumatic cylinder control valve. The rectangular container in the background is the grease pad mould.

P02 – Looking like a medieval instrument of torture, the Axle Pad Grease Press is almost complete. The mould is in place and the grease gate, fabricated last week, is in the closed position. Below the grease gate is the waiting, empty catch frame.

P03 – Failed test sample. The former plate is sufficiently indented into the grease but the grease has failed to penetrate through the holes. This test sample is resting sideways on the withdrawn grease gate.

The cylinder has been connected up and the bi-directional control valve installed. (Pic P01 above) Andrew "Noddy" King conducted a cycle test with all the trimmings, a block of grease, a dolly, a profile plate and some compressed air. The test was a failure. The grease was sufficiently indented to accept the profile plate but there was insufficient pressure to force the grease through the holes. (Pic P03 above.)

I happened to walk into the grease shop on one of my photo patrols just in time to see the conclusion of the test. It is been a while since I've seen Andrew looking so disgusted. Andrew now faces the exciting choice of either using a wider cylinder, or rigging up a hydraulic system, which can inherently supply more force in the actuator cylinder than the equivalent pneumatic system. Apparently Fred Sewell has found a hydraulic kit this week, so both options are open.

Project – GMAM Garratt Stoker Motor overhaul :

Michael Thiel has been our patient Stoker Boy, working quietly out of sight on the work stand in between the locomotives but at least being able to work in the shade. (And as we later found, directly under a roof leak!) In previous weeks, he has been fitting the donor big end bearing shells to the original crankshaft. They were all slightly too large and so each bearing had to be scraped down a little bit at the end of the bearing shells. Michael also had to fabricate a new set of thinner end bearing cap shims to keep the big end bearing assembly circular. He actually had the crankshaft, con-rods, valve eccentrics and all necessary bearings installed. However, in spite of all the careful measuring and fitting, the crankshaft still wouldn't turn properly and the rods were binding slightly. Michael does Fitting for a living, so it's not a measure of skill or competence.

But then he figured out what was wrong and didn't know whether to laugh or cry. He'd fitted the crankshaft back to front! One end of the crankshaft mounts a thick pulley-like flywheel while the other end has a square machined shank. Michael had been at work all day on Friday, did a night shift of locomotive minding on Friday night and started on the Stoker Motor without sleep on Saturday. A classic example of fatigue causing problems! He had to dismantle his work, rather ruefully. Fortunately, he was able to remove the crankshaft main bearings (roller) from the crankshaft itself without damaging them.

The following three photos show some of the work from 2 weeks ago. I hadn't "published" it, as the relevant Depot News Letter was already too long.

S01 – New Crankshaft Main Bearing installed into one of the crankcase end housings. It's merely an interference fit – no press was required to insert the bearing.

S02 – Cutting out new shims, using an original brass shim as a template.

S03 – Top view of the open Crankcase with all internal components installed (except the left hand big end bearing cap)

After a weekend away on a Rustenburg camp with his family, Michael had psyched himself up to get back into the Stoker Motor re-assembly, being very well practiced by now! But he received a request from Andrew King (as our Chief Engineer) to remove the pistons and the valve spindles for inspection, cleaning and possible overhaul. It turned out to be a good job he did too, as there were some surprises in there. The pistons weren't moving too freely anyway, because of water ingress into the cylinders.

So Michael cheerfully tackled the extra work in the project and removed the cylinder heads and the valve chamber covers. For today, Michael was "The Lord of the Rings" – 2 plain rings on each of the two pistons. The piston rings were found to be worn with ominously large end gaps of several mm. (Pic S04 below) Fortunately we have spares. The removed pistons were cleaned and the piston lands cleaned up. (Pic S06 below) There are no oil scraper rings in this double action engine. Michael also removed and serviced the various seized cylinder head studs. (Pic S05 below) Whoever last put this engine together obviously hadn't heard of anti-seize compound or copper grease.

S04 – Comparison with new and old pistons rings, the end gap of the worn rings quite evident in the lower photo, and the gap properly almost closed in the top photo.

S05 – A view of the steam ports in the cylinders. The valve chamber covers still need to be removed. Notice the two cylinder head studs still seized in place – Michael cleaned and serviced each one of the studs.

S06 – A removed piston and valve spindle. The piston has been roughly cleaned but the valve spindle is as-removed. Notice that the valve ring slots, of which seven had NO rings, have filled in with corrosion.

We have sufficient spare piston rings from Andrew's cave of treasures. However, the valve spindles were another problem. Like the pistons, each bobbin should have two rings, making 8 valve rings in all.

Imagine Michael's surprise (and disgust) when he removed the valves and they came out with hardly any friction. Of the eight valve rings, only ONE had been fitted. No wonder this stoker engine was wheezing and performing so sluggishly – but the wonder of steam powered technology is that it functioned at all. The equivalent in a car engine would be leaving out the valve seats and expecting the engine to run.

S07 – View of the empty rod chamber after the pistons and valve spindles have been removed. The valve rod apertures are the two smaller ones in the center.

S08 – An array of piston rod glands and the castellated gland nuts lay spread out on the cylinder cladding. Notice the correct helical gap in the gland seal on the left.

S09 – A newly fabricated gasket for one of the two crankcase end covers.

With the pistons and the valves removed, the gland packing could be taken out. (Pic S07 above) This is done from above the engine, with tapping on the characteristic castellated gland nuts. These were in poor condition and will need to be replaced. The engine design cleverly uses an empty rod chamber between the oil filled crankcase and the live steam components. It is vented and acts as a buffer for leaks. Michael also fabricated new gaskets (Pic S09 above) from the crankcase end covers – using the classic ball-peen tap-against the work piece methodology to outline the gaskets. However, the holes had to be marked and drilled, and the curved inner and outer surfaces had to be neatened and dressed.

A cleaned set of pistons and valve spindles were taken up to the turning workshop where James was still busy with the lathe. They were cleaned up on the lathe (Pic S10 below) and then the grooves measured for new valve rings. He was tasked to turn down some brass stock (Pic S11 below) to custom-make a full set of eight valve rings. This was in the late afternoon and James had enough time to make a test cut of one solid valve ring – without a slot. These were test fitted into the grooves of the cleaned valve spindle just in time for evening tea! (Pic S12 below)

Michael also discovered where the water contamination was coming from. In the afternoon thunderstorm that had the Bissel and Axle Boys packing up, he noticed water dripping from the leaky roof and right into the open crank case! That explains a lot.
So it was on with the vented crankcase cover (with dipstick still attached) and the whole works covered with a waterproof sack.

S10 – James measures the thicknesses of Valve Ring grooves while spinning the spindle on the lathe for cleaning.

S11 – The brass stock centered in the lathe for turning.

S12 – A newly machined valve ring blank engaged in a groove on the valve spool. The ring's slot hasn't been cut yet.

PROJECT – Class 15CA Locomotive Maintenance :

Our Class 15CA No.2056 Dorothy hasn't seen much service recently, but took a private train to Magaliesburg on Friday. She came back with a number of small faults for the snags list and these were attended to by our ex-railways fireman, Johann Breytenbach.

We Reefsteamers do our best to keep sealing and re-glanding 50-70 year old valves and valve glands. These are the "toe-nail jobs" of running steam locomotives they aren't glamourous, but you have to keep "clipping" them off from the job list. But the gland packing jobs become more urgent when the steam leaks are on the boiler fittings and devices mounted on the firebox – for the escaping steam can obscure the forward vision of the crew. For instance, the drifter valve (Pic G01 below) is on eye level with the driver's vision.

G01 – A close up of the Class 15CA No.2056 Drifter Valve with Johann adjusting his wrench to fit the gland packing nut. The cab is to the left of the picture.

G02 – Johann Breydenbach visually checks the glands for the Power Reverser's Actuator Cylinder's Valve Chamber. He's resting his left hand on the Displacement Lubricator and is actually looking at the gland for the ¾ inch steam supply line for the cylinder.

G03 – The train was stoned on a recent trip and one of the rocks smashed the fireman's window. Here the frame containing the broken glass is being removed.

There was much work to be done. The Drifter Valve, as well as the Injector Seller's Valves on both sides had to have their gland packings replaced. Johann found the drifter to be easy – but the Seller's packing needed quite a bit of patient winkling out with a stout hooked wire. The glands of the reverser valve chambers just needed to be tightened up a bit. (Pic G02 above) Johann did have the luxury of a stout, stable scaffolding frame upon which to work, as well as a boiler only luke warm and cooling down from the previous day.

Every country has its own consignment of intelligent, cultured, useful and productive people who find great entertainment in throwing stones and objects at passing trains. South Africa just has more than most, especially where the lines run past squatter camps. It isn't just plain

vandalism either – but racism as the steam trains are still usually seen to be white people's toys and a symbol of the colonial era. It's not infrequent for us to have to replace a smashed window in the coaches – but this is the first time that one of our locomotives suffered a direct hit on the glazing. The fireman was rather startled but there were no injuries – this time.

As you can see from the photo, the glass was just standard glass, neither toughened or laminated. Johann removed the pane with the broken glass, still intact within its frame. (Pic G03 above) Although the shape of the broken window is irregular, the glass is flat and should be reasonably easy for a competent glazier to duplicate.

PROJECTS – Other work around the Depot :

W01 – Senior Driver "Oom" Attie de Necker continues the tedious task of sand papering and scraping the black paint off from GMAM Garratt No.4079 "Lyndie Lou's" brass and copper work.
We want this old lady to look her best for her post Bissel overhaul debut.

W02 – Safety Officer Cliffie Mathee spent the day inspecting handbrakes on the rolling stock. Here, he is lubricating the very stiff handbrake gearing and chain pulleys on the Friends of the Rail NZ Gondola. His left hand is on the quadrant block and you can see the actuating chain angling up to the left.

W03 – Wilhelm "Willie" Wehmeyer is inspecting an upper bunk in a 3rd class compartment for cleanliness and damage in a Saturday of coach inspections. Lex and Willie are drawing up a list of both cosmetic and structural repairs that are required for our mainline coaches.

W04 – The other half of the Wehmeyer Brothers team – Lex is standing in a sleeper's corridor and writing down faults and repairs onto a clip board. It's a long list but mainly cosmetic repairs and missing fittings.

W05 – Have you got a license for that vehicle, Madam? Dorie Steenkamp takes on the onerous task of mowing our lawns – scattered patches of grass amongst the ballast and rails. Those are "The Shongololo Tracks" behind her.

W06 – Lee and Cliffie test a handbrake quick release lever. This one was totally disengaged and the one on the other end won't move – this beat up old wagon needs some serious maintenance!

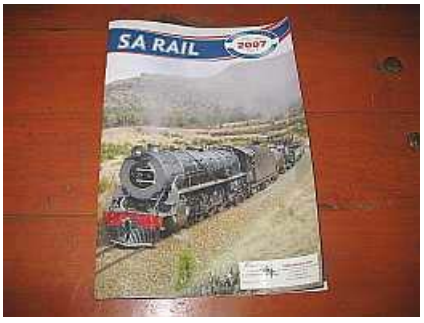
The lever is meant to disengage the handbrake mechanism without the shunter having to turn the wheel.

Pictures from around the shed :

M01 – Fred Sewell had some fun applying vinyl name labels to our new hard hats. Those Reefsteamers who have earned nick names have all had them added to their hats in red. This one's mine – the "Flash" referring to the frequent camera flashes which startles many Reefsteamers at their work.

M02 – Sometimes it seems as if running a train needs more paper work than coal! Lee Gates has just printed and delivered a new batch of train operation forms which should last the train crews few months.
Those clear plastic envelopes are vital where nearly all the Reefsteamers has gritty, greasy thumbs.

M03 – The Cute Chairlady tries on her new labelled hard hat for size. I caught her enjoying a cup of tea and looking a bit agitated after a hard rummage though the filing cabinets to check that all the files were still present and the paperwork intact.
(We get inspected on our filing, records and filed procedures.)



M04 – Safety conscious cookin' Andre van Dyk wears head protection while handling some rather aggressive maize porridge. (What South Africans call "Mielie Pap")

It has a mild taste on its own and is very useful for patching boilers, tractor tires and transformer tanks. But when combined with sauce or gravy – it is delicious and very filling.

M05 – Never ending cleaning chores. The inspection pits have been shovelled clean and the ash piles now awaits loading onto a flat car for disposal. This is the Receiving Track. You can see the blow down deflector plate just under the diesel to the right.

M06 – Our Class 15CA (hauling a service train of coal gondolas, hydraulic coal grab, six old Transnet tankers and "The Caboose") on the cover of the "SA Rail" magazine. While being on the cover was flattering, the article within that covered our 2007 Great Steam Trek was carelessly negative with its focus on a few incidents instead of the hugely successful tour itself.

- Lee Gates -

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