

Atlantic Shore Line Railway Locomotive 100
Curatorial Report no. 5
21 February – 18 March, 2007
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Since the last report, winter has come and gone, from bitter windy temperatures to the 50s. The snow that conveniently provided a sort of seal behind the back doors has turned into puddles forming a small stream running into the box. Despite my 2-week absence (visiting family in Utah and Illinois), work did continue.

As I left the Shop the other day, **Randy Bogucki** was welding the new ends on the badly corroded brake beams. **Norm Down** had been at the sand blaster much of the day removing corrosion and mill scale from truck and sill bolts. We have completed the fabrication of hundreds of new bolts (for 110 and 1160), and are in the process of priming and painting them.

A visit to A.C. Electric – Roger Paradie, A.C.'s Shop Foreman said the four traction motors had reached a state that it would be worth seeing their operation as well as what they have and will do to them. So yesterday (13 March), **Dan Cohen** and I took a drive to Auburn (about 50 miles) and had a most interesting tour.



Their Shop is basically one large room about 60 x 180 ft., all of which is accessed from a 15-ton overhead crane. (What we wouldn't give for something like that!!!) The crane ran above every other machine and piece of equipment on the floor and meant you could move anything to anywhere in the building without the use of fork trucks. We were especially impressed with how clean and neat it was. Size of motors is nothing to them, with motors of hundreds of horsepower in various stages of reconstruction everywhere. (Many of these are D.C., used by paper mills because of their variable speed characteristics.)¹ There were about men at work in the various phases, some of whom had been there for over 30 years.

In the back corner is their blasting cabinet, about 8 ft. high x 10 x 10 ft. We were surprised to see that even the very coarse blasting they had to do on our motors and truck parts was done with glass beads. One of 100's armatures was on a very large but modern lathe. There were many other pieces of equipment, some of which was of their own design, such as the D.C. load test bank which had grid resistors, very similar to those under a trolley.² Danny was impressed by the largest gear puller he had ever seen.

The state of 100's motors.

- Armatures – All 4 armatures have been cleaned, baked and their insulation resistance measured. Three of them have very high resistance—500 'megs', which is excellent. These have been given coats of insulating varnish. The fourth started with resistance of one meg and that has dropped to about 0.5 meg. Without destructive testing it is difficult to tell where the problem might be but he pointed out a small

¹ When asked about what he sees as the future of D.C. motors, he does see a very slow movement to variable-frequency A.C. motors. These do not have the essential commutator as found in the D.C. motor. This is something that will undoubtedly be a problem over the long haul.

² This had come from Bath Iron Works.

damaged area in the armature core which had been ground away in an earlier repair. While the motor would be very likely to run satisfactorily in this condition, it should be watched. At this point he is not prepared to say whether it should be re-wound or not.



Roger Paradie and Dan Cohen inspecting the questionable motor armature.



Detail of the potential problem area

- Armature bearings – We now have all eight bronze armature bearing shells, returned from A.C. There is virtually no babbitt metal remaining in them, and as stated in previous reports, they are worn as much as 3/16 in. oversize! Before we send them to American Power Service for re-babbitting, we are going to carefully inspect the two locating holes in each shells that keep the bronze bearing from rotating in the motor case. These are supposed to be 41/64 in. diameter, about 0.0156 in. larger than the dowel pins in the bearing saddles.³ Over time, the bearing tends to work itself loose under the saddle and rotate slightly, tending to wear these holes to an oval shape. A cursory examination reveals 1) that they are in pretty good shape but worn somewhat, 2) that some have been repaired previously.⁴ During yesterday's visit, we noted that a number of the 5/8 in. dowel pins in the bearing saddles had also worn and we may well be able to limit bearing rotation by replacing the pins as we did in 639's ex-Type 5 trucks. Those in 100 are far less worn but should come out easily.



Armature bearings are received back from A. C.

We also noticed the shells have worn on the outside, again due to this slight rotation. There is a definite 'parting mark' at along each side where the saddle clamps down on them. We are not quite sure whether to ignore this (depending on how loose they actually turn out to be), shim the outside of the bearing or even mill off a very slight amount from the bearing saddle to give a slight clamping action.

These bearings come in pairs: a larger inner diameter one (about 3 3/8 in.) and 8 1/2 in. overall length for the pinion end and a smaller one (about 2 7/8 in.) 7 7/8 in. long for the commutator end of the motor. The pinion end is larger because of the extra force of the pinion against the gear.

³ We are fortunate to have original GE blueprints of both types of bearings.

⁴ Now that the shells have been cleaned up, it is possible to see the different color of the brazing of the repair (lighter) than the more coppery bronze of the shell.

The shaft goes through the pinion end bearing with the pinion shrunk on. Oil leaking from that bearing will end up in the gear case. The shaft goes through the commutator end bearing and would be open except there is a sort of cap over the end. We have seen various styles of this cap (with none in some cases) over the years in this common style motor. We believe the original, made of galvanized sheet steel, is supposed to have three small 'ears' bent down and over the end of the bearing which snap into small grooves machined into the outside of the shell. Only one of the four has an extant cap and that is bent down all around the outside and sort of 'tucked' into the grooves. Two are flat galvanized steel sheet that seem to have been soldered to the end of the bearing, but not very well because the job is crude and they have almost completely come loose. The fourth has none. At this point it looks as if we will go with the original style.

These bearings represent at least two manufacturers: J. F. Hodgkins of Gardiner, Maine and N.M.B.C. (National Bearing Metals Co.) These are clearly stamped in the end of the shell.

- Re-babbitting – Before we can have them done, we need to know the diameter of the motor shafts. Roger has measured them and thinks that we can have three at one diameter but one (the one in the lathe) requires truing up so will be slightly smaller. Although we will do the actual bearing machining, we want to be certain there is enough babbit lining so we can turn them to the proper diameter plus clearance. According to the Wisconsin Utilities *Standard Maintenance Guide for Railway Equipment* August 1929⁵, the following clearances should be followed:

Nominal Bore of Bearings	Allowance and Variations Before Pressing into housings ⁶
2" to 3" inclusive	plus .006" to plus .008"
3" to 4" inclusive	plus .008" to plus .010"
4" to 5" inclusive	plus .012" to plus .014"

On the shaft that was in the lathe we noticed the bluing that remained after the initial turning and there was quite a hollow in one place. The other end had been very nicely polished.



Armature in the lathe for truing the shaft.
(The blue area on the right shaft is a 'low' area.)

- Field coils – All 16 of these have been checked and re-insulated with cotton tape (as the originals were) as needed. These were all in excellent condition. In the original there is a pad made of several layers of canvas between the coil and the case but A.C. has substituted a non-absorbent rigid fiberglass sheet (about 1/8 in.

⁵ This book was reprinted in 1978 by A.R.M.

⁶ These bearings are not pressed into the housings. That refers, in general to the 'box-frame' type.

thick). Although it's not prototypical, it will be more satisfactory in the long run. The sheet-metal inserts that go between the pole pieces and the field coil had been cleaned up and painted black.

- Leads to the motor (4/motor—A, AA and F, FF) (armature and field) Roger called yesterday to ask me the length of the new leads. (We are replacing virtually 100% of 100's wiring.) We sent them a reel of No. 4 DEL (Diesel-electric locomotive) flexible cable. The original wiring is still largely in place under the deck and has multitudes of splices. It was difficult to tell just where they should be but we settled on 42 in. for each lead. Because the motors are 'inside hung' *i.e.* between the axle and the bolster, rather than 'outside hung' where they are outside the axle, the motors do not need long leads to allow the motor to swing with the truck. Inside hung motors are used on cars that don't have to go through sharp curves, primarily interurban and suburban routes. The outside hung trucks have short wheel bases, allowing them to negotiate shorter radius curves as in inner city operation.
- The cases – Everywhere we looked we saw parts for 100. The cases, which left STM still covered with heavy layers of grime and rust, were now beautifully cleaned up and painted with a red-oxide primer. (They will end up black.) The motors are suspended from these cases by a $\frac{3}{4} \times 5 \frac{1}{2} \times 48$ in. steel plate with four $1 \frac{3}{16}$ in. holes bored in it through which go heavy $1 \frac{1}{8}$ in. bolts. To make these holes we're ordering another *Rotabroach* to be used in the magnetic-base drill.



Case with first field coil installed

General Electric CP 30 Air Compressor – The compressor is largely taken apart. The motor armature has been tested and is ok although the commutator will need to be smoothed up. In the actual compressor part, the pistons, connecting rods, rings, etc. have been removed. The main bearings on the crankshaft are very tight and it turns beautifully. They don't know the status of the rod bearings and wrist pins. (The man working on it had a heart attack while doing so and hasn't come back as yet.)

Of historical interest, we do know that the compressor under the car was removed sometime between 1919 and 1927 as the maintenance card, whose contents are copied at the end of this report, shows a 'CP' compressor.

Elliptic springs – We just placed the order with Beall Mfg. Co. of East Alton, IL for four springs. One of the terms on the spec sheet which I was to approve before they did any work was "REALS". I thought it was some sort of way they measured spring strength or compression or bending or whatever. Their engineer said it was the term for the steel they use: "Round-edge Automotive Leaf Spring".⁷

⁷ LeafMat'1 3 x .323 REALS, A160. (The original was about .307 in. so this is a bit thicker. Because of the rough rusty texture, it was difficult to get what we believe is the original thickness.)

One of the concerns I had was getting the same ride in 100 as it was supposed to have, not too soft nor 'like a brick'. One of the items on the spec was the 'loaded' height. We had pressed the spring in the hydraulic press to the extent that it appeared it had been in service, and found it took 5,000 lbs. to press it down to that point at which the loaded height was 7 ½ in. Due to a glitch in faxing these specs to Beall, that figure became '15,000' lbs. So, when the approval sheet came through I immediately questioned them because it would have been an extremely hard spring!

They explained that spring making was somewhat of a black art (my term). If you're making lots of them, you can set up the equipment and come up with some standards after you see how things come out in the prototypes. Ours is a prototype in itself. They will trial assemble it using the dimensions we faxed them based on what we found in the original. Then they will test it and let us know what they find. If it comes close to the 5,000 lb. figure everything's fine. If it's not, I don't quite know what we'll do. He said the spring makers at that point are blacksmiths and work from there in the old-fashioned way. The important thing is the 10 in. 'free' height.

Trucks – All of the material for the trucks with the exception of the journal boxes and bearings is ready for reassembly (except for those few parts which still need some painting). **Randy** brought back the truck transoms and the body bolster lower plates from **Novel Iron Works** in Greenland, NH. They ran them through their 'Wheelabrator' which removed the corrosion and applied a shop coat of gray primer to inhibit rusting during their transit to the Museum.

- Transoms are made from 10 in. 30 lb. (per ft.) channel. Unfortunately we weren't able to get any of the full 3 ⅝ in. flange width of the original. We had asked Novel to drill a 1 5/16 in. hole near the end of each, top and bottom, flange for the large vertical tie bolts in that location. The hole had to be located in what would have been the center of the original flange width but was too close to the edge of the 3 in. width. So, last week, **Bill Pollman** welded strips of ½ in. steel about 4 in. long to extend the width of the flanges. Two of them have been painted with black polyurethane enamel over the gray shop coat. The others will be done shortly.



Bill Pollman welding extension 'ears' on truck transom.

- Brake swing link hanger brackets. Like so many of the components, these triangular brackets had rusted quite badly. So Bill cut out the vertical leg of the bracket, the part that bolts against the transom where the severest corrosion occurred. He then welded in a new section of steel with mounting holes bored in. Yet to be made are the U-bolts which hang the actual swing links. These will have to be ground slightly so they fit the narrower inside of the channel.
- Brake beams – These were made by ALCO by forging a solid bar, hammering it thinner on each end to fit the brake beams. So **Randy** has had a bit of a challenge welding different thickness of steel plate end to end to duplicate the cross-section.



Randy Bogucki grinding the new brake beam end.
Note the extent of the pitting.

- Equalizer bars have now had the pits around the holes at the base of the coil springs filled.
Chuck Griffith and Bill Pollman.
- Truck bolster no. 1 is now ready to go together. We found that the measurements we had made of the necessary bolts to fasten it together were different than the original estimate so some modifications had to be made.

Bolts – With some very small exceptions we have made, found in stock or purchased the necessary bolts for both trucks.⁸ All the nuts and lock washers have also been primed and painted and the nuts tried on each to make sure the nuts spin on smoothly. This has called for a certain amount of re-threading.

Body Bolsters – The 1 in. x 8 in. plates forming the bolsters' bottom section were bent and primed by Novel Iron Works and now will require painting and re-assembly. We can't put the 'deck' back together very conveniently until there is something solid and permanent to support the sills.

A bit of history discovered – Recently **Lee Duncan** was poking in between the cab's inner wainscoting and the outside sheathing behind the conductor's desk and made a rather interesting discovery: a maintenance record for 100 from 1 August 1927 through 5 May 1928. Although the card was left over from Atlantic Shore Railway stock, it probably was used at the 'new' York Utilities carhouse in Sanford. That structure was constructed in 1924 using materials from the Town House coal pocket, razed in 1923.⁹ (Town House was closed in September 1927 upon the closure of the Sanford-Biddford trolley route.)

Some speculation: 100 must have run back and forth from Town House to Sanford with the transfer of equipment and probably hauling rail and other salvage from the abandoned lines, begun in 1928 and continued into 1929. However maintenance was probably done in Sanford. We have been looking for references to Mr. Waterhouse in the oral history Ed Dooks taped from Walter Jackson, who worked for just prior to the period of this record. He refers to a number of fellow employees but not Waterhouse.

⁸ As a matter of mass production, we also did the same with those for 1160

⁹ This barn is still in use as the Bell/Simons plumbing and heating supply company. It is in the 'vee' junction of River and Brook Streets. Inside one can still see rails in the floor.

Barnstormers! was supposed to be delivering the remanufactured timbers and decking after I returned from my vacation but nothing has been heard at this point.

Paint analysis – Bob Reich took three boards, which we believe have representative samples of the various layers of paint on them, to Building Conservation Associates in Dedham, MA. One is from an exterior door post and the other two are from the inside: one a window post cover and the other from the lowest piece of wainscot (one that appears to be in pretty good shape). We hope to visit Brian Powell, their analyst, to determine what would be the best colors to match in our final painting. We are waiting for him to complete other commitments.

Color confusion - There is some confusion as to just what colors were used on 100. According to O. R. Cummings' *York County Trolleys*, the three locomotives purchased from Laconia Car Company in 1906, were 'green with white trim'. It is obvious from photos, especially of 102 from the early years that the lettering was white. If you look at the earliest photo of 100, before any modifications, the area around the side windows appears lighter than that around the front sash. This does not show up in any of the photos of 102 of the period, so it may have just been the lighting, and the 'white' trim may only have been the lettering.

The next photo we have dates from about 1919 (hauling the tank car out of the mills). Here it is definitely all one color except possibly the sash which could be a deep maroon or 'tile' red. Unfortunately some of the photos aren't dated so we don't have an accurate 'color chronology'. There is one showing it newly painted, still with one pole, in a dark color with the number either white or silver, much brighter than any other photograph. I suspect this is from the 1930s.

Now the confusion: We have black-and-white photos taken (supposedly) in 1947 showing 100 in a maroon and cream-one pole and no number. Then there is one taken by R. L. Day on 17 September 1949 in color showing the maroon and cream scheme. This one appears in the CERA book *A Rainbow of Traction*. When we opened the small doors on the sides of the hoods we found maroon paint that had run down the inside through the vent holes, over the green. (The paint was obviously applied generously but not with the greatest craftsmanship!)

There are several photos of 100, at the end of operations, in the one-color scheme. One is dated 9 April 1949. The number is a dark color, possibly 'gold' which has darkened with time. The line was dieselized in June of 1949. There is also one undated with 102 in the maroon and white scheme while 100 is in 'unicolor'. It was also in other schemes over time as were the passenger cars. We wonder if it was done to keep the crews busy or whether outdoor storage took a toll on the equipment.

When 100 was moved to Seashore in 1949, it had two poles, the body was one color and the number was a dark color.

There is a possibility that Seashore people went to Sanford and painted the locomotive to spruce it up as they did with 38 (at Traction St. Barn in Manchester) and 39 (on the way from Ohio to Seashore), but it is unlikely. 38 and 39 were done so people wouldn't react negatively to the latest acquisitions. It is my feeling the photos supposedly from 1949 are actually from 1939, or no later than the very early 40s. But it is unlikely they put on a second pole. (That was done by R.T. Lane many years later.)

The interior of the cab is also confusing. The ceiling roof boards and down to the header over the windows are gray and white, but we think the white, which was never finished, was done by Seashore. The area around the windows is maroon(ish) but also grayish with traces of buff. The maroon is probably the most recent. The wainscot below the sash is also in the maroon with some traces of gray.

Since the two-tone scheme was really not representative of the ASL and probably short-lived, we will use the longer-lived green, actual color to be determined by the analysis. Because of its great local significance, we will be taking a bit of license and have the prominent ATLANTIC SHORE LINE RAILWAY and the Laconia Car Company logo on the side sills.

Anybody else have any thoughts on this? (It's getting lonely out here not having many companions who can remember the details!)

Another pair of eyes finds some history. On 16 March, **David Shaw**, who hadn't seen 100 in its present 'scattered' condition, stopped by for a tour. As he was being shown the photos we have on the box wall of the 'trio' of ASL locomotives: 100, 101 and 102, the noted something that has very likely escaped everyone's eyes.

In 1908, the Atlantic Shore determined they needed enclosed carrying space for their express business rather than another locomotive. So they converted 101 from the 'cab-on-raft' style to a box motor, retaining its couplers so it could pull a freight car if needed. Its cab was then added to 102, the configuration it had until the end of its life. We have a photo probably taken in the yard around the coal pocket across the road from Town House; showing 102 in its original configuration with must have been three members of the barn crew sitting on it. Off to the right in the background is what David feels (and I agree), sort of leaning slightly to one side, is the cab from 101 waiting for installation on 102. Could this have been a 'before' photo?



102 COAL POCKET SHED

102 about to be double-cabbed? Is that 101's cab in the background?

The effect of car maintenance on 100's work. As soon as the weather improves, we will have to devote our attention to getting the operating fleet ready for the season. This will mean work on 100 will slow down. We do hope to condense the parts which are presently scattered everywhere in the Shop. The first truck will start together shortly.

Wouldn't you like to be part of that?

Maintenance card found in ASL 100 by Lee Duncan 11 March 2007
(Quite deteriorated and warped)

NOTICE This Card must be turned in to the Master Mechanic when any one section has been filled out.
Replace with New Card, transferring (the) data in each section on this card to the new one.

MOTORS

Date Oiled OILER Date Repacked

TRUCKS TYPE

Oil These Journals every 13* Days
 Repack These Journals Every 60* Days

Date Oiled	OILER	Date Repacked
8-1-27*	Waterhouse*	
8-14-27	Waterhouse	
8-25-27	Waterhouse	
9-1-27	Waterhouse	
9-11-27	Waterhouse	
9-11-27	Waterhouse	
9-25-27	Waterhouse	
10-9-27	Waterhouse	
4-15-28	"	
4-22-28	"	
5-5-28	"	

(REVERSE)

Oil This Compressor Every AIR COMPRESSOR TYPE CP*
 10* Days

Date Oiled	OILER	Am't Oil Used
7-4(?) -27	Waterhouse	
? ? -27	Waterhouse	
8-23-27	Waterhouse	
9-1-27	Waterhouse	
9-11-27	Waterhouse	
9-25-27	Waterhouse	
10-5-27	Waterhouse	
10-13-27	Waterhouse	
4-15-2(8?)	"	
4-22-2(8?)		
5-5-(?)		

OILING ATLANTIC (SHO)RE RAILWAY

Car No. 1(00?) 8-??-27*

Type of Mo(tor?)
 (??)ors every 7 ?? Days
 ????? These Motors Every 20* Days

Date Oiled OILED Date Repacked
 (Various names including Waterhouse but hard to read) (Dates Illegible)

*Written in with pencil