

# Gartenbahn Profi #3/03

English Summary

Editorial

## Hello there... Page 3

.....and welcome to the first issue of the GARTENBAHNprofi, the magazine for garden railway enthusiasts and others who like Large Scale.

Actually we wanted to call the magazine "GARTENBAHN-EXPRESS" but changed our minds while working on this issue. A good decision, in our opinion. Even if the "Express" is missing from the title you can count on us to provide you with the material of which dreams are made right on time, in two months intervals. We fulfilled one of our own dreams: producing a magazine which we ourselves would like to read. We, that is the publishers; Hans-Joachim Gilbert (43) and Friedhelm Weidelich (50).

Many of the readers will know Gilbert as the editor of the "Modelleisenbahner" and the "Eisenbahn Magazin". Today he is the editor of the ROCO "Modellbahnreport" and takes care of additional magazines through his media agency.

Weidelich has been writing articles for model railroad magazines since he was a youth and after his start in the computer industry made a name for himself as editor with the business magazine "DM" and as a freelancing technical journalist with the most

Real value

## Bachmann's Indie Mogul...Page 10

There was no prior announcement, but one day she was on the shelves. The small Baldwin from Bachmann is at €200 quite a bargain. The question is: at that price do you get good value? We had a closer look.

Matthias W. Baldwin was a very talented steam engine designer. In 1819 he started his own shop in

reputable newspapers and magazines in Germany. And being as only one can be the lead editor, he is designated as "primus inter pares" the first among equals.

The publishers divide the work according to preferences, Friedhelm likes the American stuff and there will be more authors addressing those themes. Hans-Joachim takes care of the production chores, much of the European stuff and technical items including DCC.

A growing number of knowledgeable contributors are lending their support, expanding the knowledge base.

Because a garden railway is a very relaxing und beautiful hobby, we plan on pointing the way following the wide world along the garden right-o-way. That world is more multi-facetted than would be assumed from catalogues, newsletters and magazines. We are not beholden to any manufacturer, form our very own opinions and approach the hobby from a journalistic perspective. We aim to expand horizons, provide new perspectives, have a few surprises, pass along proven tips and provide value as well as entertainment. And, of course, stuff to dream about.

Philadelphia he had apprenticed as a jeweler and in 1825 went into partnership with David Mason. Around 1834 he designed, amongst many other improvements on steam engines, the first crank-type axle. His style didn't restrict itself to the looks of the engines, some of which ran on the Royal Württemberg Railways. No, it also found expression by the

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We will do our best to fulfill the expectations. In the process we will satisfy our own curiosity on all the new, surprising and noteworthy items.

Because experience tells us that with a garden railway learning along the way is as important as reaching a goal. One will always learn and there are at least three solutions for any given problem. This multitude we would like to explore and along the way acquire more knowledge and have some fun.

Afterall a garden railway is supposed to be free of stress; instead it should relax and allow for creative discovery. Not least of all one goal will be to create a miniature world by oneself or with the family which is a joy to see und a distinct experience.

We would like to thank our garden railway friends from North America, England and Germany - for the trust they placed in our project, even prior to seeing concrete results. Therefore: A warm welcome to our readers in the UK, North America and Australia!

We will try to fulfill your expectations and wish you a happy garden railway season for 2003. And happy reading! Last but not least: we are looking forward to your comments, suggestions and feedback.

mid 1800s in the design of modular units to be used for different engines. A concept which has only recently been revived in order to achieve cost savings.

If one ordered an engine from the Baldwin Locomotive Works in 1881 one would specify the track gauge, cylinder and drivers size, type of fuel, height of the couplers and the

clearance profile. A short time later the engine would be ready for delivery.

The Bachmann model is one of the modular types built in 1921, but Bachmann went one step farther and utilized the modular system by using parts from different Bachmann models. The small engine was used on the narrow gauge networks of mines, logging roads and industrial works; most often on either 2ft or 3ft track. Mogul designates the 2-6-0 wheel arrangement. One of the small units has been preserved at the Hesston Steam Museum, LaPorte County, Indiana. It looks much like the Bachmann model except for the cab and the running boards.

The extra-ordinarily detailed model surprises by its low weight of only 1.5kg despite scale 1:20.3. However the prototype was also very light and only slightly larger than a FRR engine running on 2ft trackage.

### **Plastic and high-quality metal parts**

The body, tender and the frame are injection molded plastic. The running gear, as well as the wheels, consist of metal castings. The bell and safety-valve are turned brass.

The power pick-up from all tender axles and the driving axles is very good and uses strips which ride on the axles. Gone are the coil springs which would "get fried" when the current draw would get to a peak. The axles are not sprung and have minimal vertical play. The drivers (40mm diameter) have 2.5mm flanges and lack traction tires, which is a plus as those create more problems on garden railways than they add traction.

The detailing is excellent, especially considering the price bracket. Included are sanding pipes formed from wire, a movable bell mounted on a metal bracket, a whistle made of flexible plastic, a metal generator and dummy cut-levers made from wire. The tender features handwheels and valves, but the brake shoes are, in contrast to the engine, missing. The

cab is a real show stopper; piping, hand wheels, pressure gauges etc. etc. are separate, plastic parts. The Johnson bar is, like a few of the other parts, a metal casting. Also worth mentioning are the large head and tail lights complete with reflectors and illuminated by yellow LEDs. The flat finish in black and dark gray on our test sample was very good, except for a minor blemish below the cab. The striping and lettering are crisp as is the builders plate. The toolbox hinges on the tender have been highlighted with a brass colour. Included are a crew (engineer and fireman) and a small flask of smoke fluid. Only the 9 volt battery, which goes in the water filler hatch of the tender, needs to be purchased by the end user.

### **Runs well, but lacks power.....**

After connecting the cables from the tender to the engine, the engine is ready to roll. It accelerates gently and smoothly. There are no power pick-up problems and the engine rolls without any hesitation through turnouts. There is a slight side to side roll at higher speeds but even that is prototypical. The less than perfectly mounted tender wheels create a slight rocking motion, but at medium speeds it is barely noticeable.

The vertically mounted motor (in the fire box) drives the center pair of drivers. The low weight of the engine (only 1kg without the tender) results in limited pulling power. The engine will move 4 heavy box cars on straight and level track but will lose traction as soon as it encounters a 1.2m(4ft) curve pulling that load. Our test showed the engine will pull a boxcar and a flat car without problems on our layout that has gentle grades and minimum 1.2m radius curves.

According to the drawing provided with the engine, there is no weight mounted in the boiler. Experienced modelers will be able to improve the pulling power, but need to keep in mind that this an engine just slightly larger than what is found on a FRR.

Being as it is built to 1:20.3 scale it looks larger than it is when set beside a LGB Mogul. Set it beside a Bachmann Connie and the size difference will be plain.

A nice feature is the polarity selection switch behind the smoke-box door, which is a standard feature on Bachmann engines. It is easy to make the engine travel in the same direction with the same polarity as European products. At the same time it is very handy to set up a traffic pattern where two opposing trains alternate, without having to reverse the polarity for either train.

The sound module is simple as was expected. Only at low speeds will there be exhaust with some reverb. At higher speeds this changes to an indistinct roar. There are no sounds when the engine is standing. In view of the reasonable price of the engine, the sound module is acceptable.

Slightly undersized is the smoke generator in the stack, which only generates a meagre plume at higher speed. Again: considering the price it is at least included.

The low mounted Bachmann couplers will only connect to Bachmann cars. The new side dump cars or other two axle cars would be a good match. The front coupler's centering spring is too stiff and will create problems in tight curves. Exchanging the couplers for Kadees is no problem, the rear coupler could also be swapped out for a standard LGB coupler.

There was no manual included, however the exploded view drawings show the many different parts and will be helpful for dismantling and reassembly of the engine.

### **All in all...**

The right engine at a good price for light trains both indoors and outdoors if there are no inclines. It is also a perfect candidate for kit-bashing. Experienced modelers will compensate the lack of power by adding weights and heavier figures. Those who can accept its limitations will be pleased with this diminutive engine.

## It's on delivery... Page 16

A new type of shopping experience is being proposed by EPL makers of the LGB line. The end user gets to order via an Online-Terminal at his favourite dealer and gets almost overnight delivery to his door step.

Critics suspect the re-introduction of the "fixed-price" system by the back door.

What is really behind the eXtra concept?

That's the question Hans-Joachim Gilbert presented to Lehmann CEO Rolf Richter, Klaus Baumann and Günter Kopp from the LGB Marketing team.

"To be frugal is in!".... the slogan dreamed up by a Düsseldorf ad-agency for one of their clients in the entertainment-electronics discounting business, has become a stock phrase. Not just because the economic situation encourages penny-pinching and purchase postponement as the Euro sits tighter in the wallet than the D-Mark used to: It has simply become fashionable again to save.

The toy trade, typically the purveyors of model trains, share in the trend. Is a toy dealer still able to stock the complete line of any model railroad manufacturer? Many dealers have answered the question with a resounding "No". Even in Nürnberg, the toy capital, a large, respected toy dealer decided to move from the center of town to the suburbs, but without bringing along the model train department. That department bit the dust because the extreme price competition meant a steady decline of profits which need to be made in order to cover the large overhead in the central locations.

### **"We want to retain the qualified dealer network at all costs"**

Rolf Richter, CEO EPL

A development which has been noted with concern at EPL, since the large size LGB boxes take up a lot of expensive room at the dealers'. If the

turnover of the displayed goods is slow the dealer will have a cash flow problem, will as a result refrain from displaying as much and as a consequence, perhaps quite unintended, the demand for and interest on a certain product line will fall.

The sale of LGB products on the Internet - at or below wholesale - will do the rest.

"If the trade decides to flog the merchandise prior to Christmas - the major selling season of the year - then the alarm bells ring at the manufacturer's" comments Rolf Richter regarding the seriousness of the situation. The skewed position of the market hasn't just alarmed the world's #3 manufacturer, there has been a call to action. The concept of combining the dealer network with Online distribution created and originally launched by Herpa was finetuned and adapted for LGB's purposes.

EPL CEO Rolf Richter: "We answered the call of the dealers to lend some help. Should LGB only be sold through the Internet and Online auctions, we fear for the continuance of our product line."

Established garden railroaders will find the product, but it will be harder and harder to bring the product to the novice: "Impulse buying will be non-existent and they are only possible with a brick and mortar presence" declares Rolf Richter with emphasis - and concern.

"Impulse buying" isn't supposed to equate "Bargain opportunity". Left overs and end of the line items at rock bottom prices won't be found in the eXtra shop, assures Richter.

But how will eXtra shop change the distribution chain to the customer?

One thing is for sure: Not every dealer, who today carries LGB, will tomorrow also carry the eXtra shop items.

EPL started the concept in Germany at the beginning of April and plans to expand, for the moment, to 150 dealers. This because the concept requires considerable financial resources in the millions.

The Nürnberg Toy Fair brought a good response from interested dealers and next year could bring better geographical coverage. In areas where there are larger gaps, EPL will do direct promotion of the concept to prospective dealers. However EPL doesn't consider opening their own stores. "We are and intend to remain partners with qualified dealers" says Rolf Richter. LGB's philosophy excludes having a row of shelves with an Internet connection, but emphasizes presence where experienced and well-trained employees are part of the organization. "We need the qualified dealer network for our common future."

### **"We will continue to offer Top items as part of the standard line"**

EPL marketing director Günter Kopp

The customer will in future experience the exclusive items as well as the standard LGB selection in a virtual way that still retains the personal advice. The dealers are quite taken with the concept. "Afterall the eXtra shop promises the hottest new items and by doing so attracts customers to the dealer. We will continue to offer Top items as part of the standard line" counters Günter Kopp to deflate the rumours which have been circulating since February in various Internet fora. "The new RhB Tm tractor, and even more certainly the V10, are proof that items in the lower price brackets will be part of eXtra shop." On the other hand it is far from reality that the regular line wouldn't get its share of interesting new items. An example: While the RhB ABt 1702 is restricted to the eXtra shop, the version in the blue Arosa livery is part of the

standard line, to complement the two existing cars.

What is the "LGB qualified dealer system" It presents itself as a row of shelves in LGB colours, filled with assorted items from the standard LGB line as well as the eXtra line; the dealer chooses which items he displays. Marketing director Kopp: "Whatever the dealer doesn't have on hand, he can order rightaway or the customer does this himself at the terminal and gets the parcel delivered to his home, the dealer or any other address of his choosing."

At the heart of the eXtra display is a PC, the connection to EPL. As soon as the customer who needs to be pre-registered logs in on the dealer's terminal he is able to browse and shop from the complete LGB product palette, not just the eXtra program. The real advantage for the customer is the immediate determination if the item is in stock and available for shipment. Much like one is used to from the Internet.

With the distinction that the customer surfs at the dealer's and delivery happens from EPL — at a

price that is precisely the same in Munich or in Chemnitz.

**At the dealer's the consumer receives advice and the assurance that any LGB item will be delivered within the shortest possible time.**  
Rolf Richter, EPL CEO

"Thus we achieve two goals, the customer receives advice from his dealer and is assured to receive any of the LGB items in the shortest possible time. And this will in future, through the eXtra concept, be possible even from dealers who thus far couldn't afford to stock the complete LGB line." states Rolf Richter with much conviction during the interview. Precisely the reason the eXtra item will be handled by brick and mortar based qualified dealers and not by exclusive mail order. Personal customer service combined with virtual shopping is the future according to LGB.

Richter: "Wie have to create a shopping experience which encourages impulse buying. The consumer can visit the dealer in the knowledge: I will be able to purchase the items and receive them within 2 to 3 days. The consumer

doesn't like to hear: I should have that in stock in about three weeks. It is also important for LGB fans, to be able to participated in special events at the eXtra dealer's."

Even those who haven't registered yet — either on LGB's website or at their favourite eXtra dealer— as LGB-eXtra-customers can benefit from the new concept, provided they visit an eXtra dealer. The dealer will be able to order items on the same prompt delivery basis, with the one difference: instead of receiving the goods delivered to your door by the friendly postman, you'll need to pick up at the dealer's. But, in conjunction with a nice chat at the store, that should be an OK experience.

According to Rolf Richter, bargain hunters will have a problem tracking down eXtra items from auctions or their neighbourhood "basement dealer". "We want to retain the qualified dealer network at all costs" emphasizes Richter, because neither LGB nor their consumers can do without.

## “Change of the Guard” at EPL... Page 17

" I decide what constitutes reality. That's how the LGB fan perceives his trains" says someone in the know. Klaus Baumann is almost an institution at LGB. He has been building and caring for the LGB fan community for decades. In a few months the 67 year old head of public relations (on the right in the picture) will retire, in the knowledge that a committed model-railroader and marketing expert will take his place at Saganer Street. Günter Kopp (45, on the left in the picture), formerly the manager of the Karstadt department store in Nürnberg, made the change at the start of the year.

Those who, three years ago, visited the DB-Museum during the centenary celebrations will perhaps recall the

steam engine complete with a band on a flatcar in front of Karstadt. The department store had a complete "Trains" theme, from the fashions department to the toy department. This promotion was initiated by Klaus Baumann and Günter Kopp.

The "change of the guard" will be gradual and no one at LGB expects Klaus Baumann to relinquish the LGB-Club duties. Because promoting the fun of playing with trains and keeping the flame going has always been very close to Klaus Baumann's heart. "This market segment has no lobby" is his sober statement and he agrees with Rolf Richter's opinion: "Modeltrains still have a slightly negative slant. It is the basement hobby of the husband, who doesn't always

gets shared with the rest of the family."

In contrast to the USA, for EPL always an important market even prior to LGB, where garden railroading has advanced to "a life style" (Rolf Richter: "Still almost unthinkable in Germany"), PR-man Kopp will have his work cut-out to "convince mothers that modelrailroading shows results. One can learn a tremendous amount playing with trains." In his experience: "90% of adult males who buy a starter set for their children, really want the train for themselves". Klaus Baumann knows the reason: "They buy their own play time entertainment." Kopp sees the big advantage of Large Scale garden railways in being toy as well as modeltrain. The modelrail-roader shows more tolerance. Despite

adding more realistic detail to the rolling stock: Outdoor reliability and quality will remain the goals in product development. "We attempt to draw a realistic picture" In this Rolf Richter includes the decision to build a Mikado that runs on narrow gauge. "The LGB-

fan places much stock in play and fun." Or, to quote Klaus Baumann: "The user decides what is reality" Models, like the 99 633, that are produced in cooperation i.e. with Aster, will be more prototypical - but the garden railway horizon at LGB will

remain in place, even after the generational change.

Richter: "There is good reason why we speak of "The world of LGB". "

## eXtra items... Page 18

The eXtra concept has two separate lines: the Standard selection and the Premium selection. Both lines are only available through the eXtra dealers in Germany, Austria, Switzerland and the Benelux countries. The 20 items in question, according to LGB all "Top-New items", are clearly marked

with the eXtra logo.

Premium items are only available by ordering at the terminal of an eXtra dealer. Registered customers will, at the same time, also be able to order anything in the regular LGB range of the respective country.

The Premium items for 2003

include amongst others: ÖBB Diesel 2091 004 (LGB 21522); DR-Harz Railway 99 7222 (LGB 21811); LGB /ASTER Mallet 99 633 (LGB 22832); as well as versions of RhB engines Ge6/6' (LGB 25402) and Ge4/4" (LGB 25432). In addition there a few cars i.e. the RhB ballast train (LGB 29452).

Dingler's 99 193: Too good for a garden railway?

## Superb workmanship... Page 20

Only one hundred Large Scalers will be proud owners of the first hand-made Dingler engine in 1:22.5 scale and likely put it in a display case. GARTENBAHNprofi dared to run the exquisite model in the garden. And gave some pause for thought....

Limited-production model, anyone? Forget it, much too expensive and strictly for the display case! Running the Dingler engine, which is compatible with LGB's scale, taught us otherwise: Being expensive doesn't mean a lack of value - and besides allows for a new set of dreams. Those who have seen Dingler's ads probably admired the 99 193. The hefty DB Meter gauge engine doesn't look like a model, she sets the benchmarks in the scale. Just like that. The flat satin finish, the high weight (7.2kg), the excellent detailing and the solid feel leave the garden railroader with the impression to be looking at an exclusive product.

### Artisan work for connoisseurs

What is for most garden rail- roaders a new experience, has been known to collectors of O and 1 scale

models for decades. They got accustomed to the substantial prices which reach into the 10'000 Euro region and are certain that they will get a model which is strictly limited to a given number of pieces, preserves its value and features almost every detail on the prototype in meticulous scale. Etched brass sheets, cast as well as turned parts, stainless steel wheels and accurately modelled cabs let you forget that this is but a valuable miniature of the real thing. A well-executed Limited-Series model has the same aura as a handmade clock mechanism - and exceeds it as for as artisan know how is concerned. It therefor can't be in the same price range as an industrial model made in the thousands.

€ 4'580 for the Dingler 99 193 is no bargain, but the buyer gets extremely good value. The model made of brass, stainless steel and several meters of, in some cases extremely fine, wire doesn't just impress with its high weight. It also is a joy to behold, every power cable, lube line, every hatch and door is modeled in detail. The smoke box opens after one turns the latches. One doesn't need a hammer like on the prototype and then discovers the spark arrester in the stack. The illusion is

only spoiled by the electrical wires which feed current to the headlights. The water tank has a multi-part locking mechanism. The three vents on the cab roof, properly elevated on stand offs, can be opened and adjusted. The lids on the coal bunker hide the switches for motor, cab lights and head lights. A silently running Faulhaber motor (27W) is installed in the boiler. The motor runs at 12V nominal and a special circuit protects against higher voltages. The running quality of the heavy engine sets new standards, never before have we seen a model which accelerates as gently and coasts as easily. This isn't just a result of the high weight, but as much because of the free wheeling drive which acts solely on the center driver axle. The axles are equipped with ball bearings, sprung and have lateral play. The engine will negotiate R1 (2ft), but we would recommend a minimum radius of 1m for esthetic reasons as well as the fact friction will play on tight curves. The engine would destroy soft brass track of the R1 variety in short order.

## Previously unavailable joy of operation.

Our test engine negotiated the stainless track on our garden layout without a hitch, there was no hesitation and diverging routes of turnouts with 4ft radius didn't cause as much as a slight wiggle. Running with a PWM controller (Train Engineer) produced even better response than the conventional DC.

The headlights come on when the engine moves unperceptively. The top speed scales out to 30kmh.

The powerful engine has properly sprung center-buffer couplers, the pin of which is attached with a tiny chain and can be inserted with a pair of tweezers. Two coupling links are included, as are the rubberized brake hoses. The cab features a multitude of gauges, levers and handwheels. A LGB compatible loop is fastened below the center-buffer. As far as we could determine the model reflects the state of the engine in 1963, according to which Josef Dingler developed it. The only "micro

flaw" is the fact that the DB headlights are fitted with flat glass rather than the convex type that was used.

The analogue test model had no smoke generator. The digital version (at the same price) features an ESU-sound decoder. Exhaust, whistle, bell, cab light, smoke generator, couplers and the switcher's whistle can be actuated through the decoder.

Dingler plans on offering the DRG version in the near future. Of that version and the DB version there will be 100 pieces made. Each engine comes in a solid cardboard box which is numbered and has a certificate. Those who would like to acquire one need to make up their minds.

As we ran the engine, for which Dingler plans to produce the Swabian freight and passenger cars (next year), our thoughts started to wander. The perfect ability of the 99 193 to perform on a garden railway would lead one to forego many of the industry wares, despite the hefty price of the engine; and, with a few cars, run a prototypical operation on a scaled down layout. Whoever decides to run a Dingler

engine on a Swabian short line, instead of a multitude of trains, hasn't just got a jewel in the Garden. Limiting the numbers of the rolling stock and instead going for the best that's currently available, certainly has its rewards.

It all depends what one's personal dream is that's to come true in the garden. The Dingler 99 193 is certainly a dream of an engine.

## Less can be more

**Summing up:** Dingler's entry into 1:22.5 is a winner. The 99 193 sets the new standard for models on 45mm very high and offers, despite the price, excellent value. The engine is not only a super model for the display case, it will do super duty in the garden. However the owner needs to keep in mind that traces of wear will be part of running in the garden. But which owner of an antique car leaves his treasure in the garage?

# Starting out: Eleven tips for the beginner... Page26

You leafed through the catalogues, day-dreamed for weeks, measured the garden, drew the plans and even laid down a circle of track on the lawn. Now it's time to get working on the garden railway. But those without experience won't know the rules. That's how mistakes are made which will show up during operation and often are very frustrating to correct. We assembled eleven important tips, which should help you avoid frustration and save some money in the process.

The following expert tips will help you avoid eleven typical beginner's mistakes. We speak from experience! If you observe the basic rules, you'll enjoy your garden railway right from the start.

**Mistake 1: The small Indoor layout in Large Scale**

Generations of HO modelers created their layouts in the following manner on a four by eight: one loop, a second loop, add a passing track and a few sidings. The track plans found with the starter packs and in the catalogues for both HO and Large Scale have toy character and are intended to sell more product. That is perfectly legitimate; however using the table-top concept will automatically lead to an optically questionable layout, which would better fit a collection of windmills, gnomes and castles built of pebbles. The respect of neighbours and fellow model railroaders won't be earned by that method and the novelty will quickly wear off.

**Our Tip:** Forget about manufacturer's catalogues, HO and N scale track plans; instead go in the garden. Look for obvious paths through the garden or plan,

if necessary and desired, a revamping of the garden. You shouldn't end up with a clearly visible loop. Don't overload the garden with track and structures, follow the natural flow. That is how one achieves a miniature landscape instead of Disneyland.

**Mistake 2: A layout without a theme**

As alluring as manufacturers' catalogues can be: Even the largest garden will most likely fail to have the space for all the themes and models presented. Buying rolling stock according to colour, "beauty" or other non train-related criteria will quickly accumulate a "collection" which will cause amateurs and people in the know to shake their heads. A toy-empire which features Swiss Meter gauge beside Saxon narrow gauge on too broad a track, field railways and standard gauge leaves even with outsiders the impression of a non-realistic toy. A garden railway should be

a model railway, including a theme and accessories that fit it.

**Our tip:** Be creative! Design your own layout that will be unmistakably yours. The selection is huge: the Rhaetian Railways as the mountain railway on a slope (but please with catenary!), a small island railway along a pond, a mining railroad, the American logging railroad with geared engines, a field railway feeding a brick works or being used to harvest peat, the narrow gauge railways of Lower Saxony with the Wismar railbus, milk cans and cows, the Colorado 3 footers, the Swabian Meter gauge, Bavarian cog railway, North American standard gauge with long trains and MUed engines, the amusement railway modelled in the gaudy Disney style, German standard gauge or a private railway with a happy mix of unlikely rolling stock. All these are themes that are fun to build and set a goal: the real life gardenrailway, which gets admired.

Mistake 3: The radii are too small

Starter packs are intended for the children's play area and to be run around Christmas trees. The curved track with 600mm(2ft) radius is OK for short two axle equipment and field railways. R1 is almost useless for garden railways, because of all the problems the tight curves create. Cars that are longer than 300mm(1ft) not only look ridiculous on R1, but can only be used if one makes all kinds of compromises. Lack of space is no excuse. If one has only a flower bed, one should go to a smaller scale (O scale) or select a field railway which will be happy on the tight radii.

**Our tip:** Plan generously, use 1100 to 1200mm(4ft) as a minimum radius, combined with turnouts of the same size. If at all possible use radii of 1500 to 2000mm(5ft - 6.75ft) and use easements at the start of the curve. The rolling stock will run much more smoothly and won't derail (tip to the inside) when you run long trains. There will be less wear and there on both track and wheels; the trains will look more prototypical.

Even long rolling stock (2.5 to 3.5ft) will negotiate those curves and one doesn't need design compromises which are prone to failure.

Mistake 4: The grades are too steep

Powerful engines like Arist-Craft's SD45 will pull 24 boxcars up a 5% grade. Add a few curves and the forces will be large enough to tip a ten car train on 1200mm(4ft) radii or truck mounted couplers will cause derailments. The drive trains of the engines will be under considerable strain. If one adds extra weights to increase the pulling power, the wear of axles which have no ball-bearings and the plastic journal boxes will increase.

Light two-axle engines will have a real problem on damp or wet track laid on a steep grade.

Even if an engine pulls twelve box cars on flat track, the fun ends if the same engine spins pulling three boxcars on curvy, steep track.

**Our tip:** Plan your layout that 3% will be the maximum grade with straight track and 2% the maximum for track that has 1200mm(4ft) minimum radii. You will have less wear on your engines and fewer problems when operating.

Mistake 5: The wrong type of track

Even if the owners of practical rail-cleaning engines tell you otherwise: brass track on garden railways is only recommended when trains are run very often, the trains are battery powered or run on live steam. In all other cases your spur of the moment "let's run some trains" will require cleaning of the track. Brass oxidizes very quickly when exposed to the weather and will require regular cleaning. How much cleaning will depend on the climate and the pollution level. The cleaning process creates small scratches on the brass surface which will retain both oxide and very fine dust.

On the other hand there is nothing to prevent brass track to be used indoors, as the oxidation will be much less.

**Our tip:** Use stainless steel track or nickel-plated (brass) track, use long pieces of flex track, use rail clamps and you will need to clean only on occasion. Perhaps beneath trees which drop sap. Even stainless steel track that has been covered by a dirt slide will work perfectly as soon as you sweep away the dirt. And of course after weeks of non-operation or after snow has fallen - all without any

prep work.

Mistake 6: S-curves and kinks

Those who use cars that are longer than the shorty 2-axle variety should avoid both S-curves and abrupt starts on a grade.

Not only do S-curves and abrupt changes look ugly, they will be the cause of derailments, false uncoupling and generally jerky motions which will destroy any illusion of a "railway".

**Our tip:** Add at least 600mm(2ft) of tangent track between curves or use large radii. This will mean less overhang on the longer cars. Use vertical easements at the beginning and end of grades; the longer the equipment, the more gentle the easement. General rule" length of easement at least 800mm(2.6ft).

Mistake 7: The missing power conduits

There are many locations on a garden railway where power will be required: lights in structures, electric turnouts, smoke generators, small water pumps and the repeated feeders to the track at 20 to 30m (100ft) intervals. Different supply lines will be required, especially if the layout is not running on DCC. DC traction power for analogue operation, half-wave DC for the turnout motors and 12V AC for illumination and other accessories. The conduits should protect the power lines from garden tools and small rodents.

**Our tip:** Bury a multiconductor (4 or 6 conductor) cable either below or beside the track.

You will find special cables, as used to power the low voltage garden lights, at most of the "big box" building supply stores.

Plan your future power requirements and install the extra cables ahead of time. Terminate the cables in a junction box or bring them to the surface and cover them with small plastic bottles to keep the water away.

Be sure to check the safety requirements of the power supply prior to connecting the distribution lines. Use the following as a cardinal rule: "All 110V powered transformers and power supplies are to be mounted in the house!"

## Mistake 8: No water features and walkways

Garden railways pose a completely different set of problems for the builder. The weather will alter the more or less artificial miniature landscape. Dirt slides, wash-outs, water in tunnels and underpasses, flower petals, leaves and sticky sap will keep those busy who failed to plan ahead. Forgetting the access to turnouts and tunnels will create a maintenance problem.

**Our tip:** Avoid placing turnouts below trees and shrubs. Study the contours of your garden to determine where water and/or leaves will accumulate.

Plan for rain water drainage, especially in cuts and underpasses. Design creeks and ditches to avoid the right-of-way and if necessary run culverts under the railway.

Using your sprinkler lets you determine which route the draining rain-water will take. Using retaining walls, bridges, creek beds and earth dams will prevent wash-outs after the next down-pour.

Integrate narrow walkways and stepping stones to reach all parts of your layout without throwing-out your back or trampling the landscape. Test runs will easily show which are the most trouble-prone sections. Providing for easy access will be appreciated as you age.

## Mistake 9: Not enough power

Power supplies and DCC units which

have no problem powering two to four engines on an indoors layout, will often be too small for the garden. Totally useless are the power units from the starter packs.

Large engines, lit coaches, the voltage drop in the track and the insulating layer of very fine dust can easily increase the power demand to 60 or 100W. Heavy trains, MUed engines and long grades will increase the demand even more.

**Our tip:** Buy power supplies that deliver at least 80W if you plan on running more than one engine at a time. An excellent choice are switching-power supplies (as used to power computer and other electronic equipment), of course these need to be mounted in a dry location protected from the weather (i.e. in the house).

## Mistake 10: The grand scheme

If you're not, all at once, an engineering genius with CAD experience, a professional surveyor and a extremely avid gardener you can forget about getting the perfect garden railway on your first try. It will take one or two years to determine the quirks of your rolling stock, how your garden reacts to the different weather patterns and which materials will stand up to the elements.

**Our tip:** Don't try to plan and achieve perfection, start small and build on it. Perhaps a windy loop that allows you to test your equipment. Expand a bit at a

time and try to remember the space required for branch lines, towns and industries.

## Mistake 11: Lack of patience

A simple setup to get experience and for testing can be installed in five hours. A well-designed garden railway on the other hand will take about five years to reach a point of maturity and perhaps ten to appear as if it is an organic part of the garden. By that time you will have made dozens of modifications.

**Our tip:** Let your garden railway grow like the prototypes did many years ago. You will always discover new possibilities, as well as planning errors because not every piece of equipment will run everywhere or pass all clearances.

Don't pour your road bed in concrete, too much work to remove it if you change your mind.

Try out different consists which you push and pull to see how things work on a temporary track; then proceed to install the permanent track. Nothing on a garden railway is "forever". Nature, wear and your creativity will see to it that your layout changes. But you will find unexpected joy; as the Americans say: "Garden railways are addictive." All this without any dreaded side effects - apart from the shrinkage in your wallet.

Modeling 120m of elevation

# The Bonsai Railway... Page 32

A sizable property in the forest, time and patience to scratchbuild, as well as a knack for Bonsai - if one has all that the results have to impress. Thomas Bitter has been gaining experience with garden railways since 1976. The following is his latest effort modelled after RhB's Arosa line.

"Next stop, Langwies!" blares the PA system, prior to the local train stopping at Langwies to let off a few hikers. A tight right hand turn leads on to the Langwieser viaduct, the longest bridge on the Rhaetian Railways (RhB) network.

Swiss-ophiles know already: We're on the Chur -Arosa line and have just crossed one of the railway-technical highlights of the RhB. This line offers the modelrailroader everything: tight curves, steep grades, an unbelievable variety of bridges and viaducts, loops to gain height, quaint wooden stations and in Chur even a portion that looks like streetcar trackage.

This had to be the prototype for my garden railway, which I call Bonsai Railway. "Bonsai" because it is a railway in a Bonsai garden. This meant I could combine two hobbies and have scale

vegetation with miniature trees. More about that later.

## 15 minutes to surmount five meters of elevation gain.

The layout started in 1997 as an American logging railroad located in true wilderness. After building RhB layouts for the previous ten years at a different location I wanted a freelance railway with no restrictions. After conquering the wilderness, which is on a steep slope, and finishing the first section for testing - complete with catenary - the RhB visions resurfaced. And in the end they won out.

The changes and the new construction started in the Fall of 2000 and is far from complete. After extensive surveying of the property a track plan was devised that had to include as many of the prototype's features as possible. These were assembled to suit the terrain and have a different order from the prototype's. Five meters of elevation had to be gained from one end to the other which in real life would be 120m. A total of 200m of track has been laid. To follow the prototype Chur had to be at the lower and Arosa at the upper end of the line. There is a considerable expanse of terrain due to the elevation difference. Gorges, mountains and tunnels separate the different portions which avoids the "spaghetti-bowl" syndrome, contrary to the appearance of the track plan. Viewing the whole layout from one point is impossible. The travel time from Chur to Arosa on the models is about 15 minutes at scale speed.

### **Breathtaking bridges**

Most of the replicated scenes center on well-known or not-so-well-known bridges, each of which is a different type. They awoke the civil engineer in me: it started with viaducts in masonry style, which reached a first zenith with the Castiel-Ravine viaduct. The viaduct has three deck truss bridges resting on two piers. The model piers were constructed on site, consist of small pieces of slate and reach a height of 1200mm(4ft), the upper end of the bridge leads straight into a tunnel which pierces a rockwall which is about 2m(6ft8") in height. The result did wonders for my confidence and next I tackled the Langwieser viaduct in steel-reinforced concrete. By far the most work involved the careful planning of the project, from the precise surveying of the terrain to the very careful removal of the forms on completion. The most important part was the proportioning for the garden. On a garden railway it is less important to get the bridges exactly to scale, what counts are the pleasing, believable proportions which span a given valley. On thing that was missing at the Langwies site was the required height to construct a parabola. I therefore, after careful study of the prototype decided on a circular span which would allow for more reach without requiring the height. This required recalculating all the dimensions, but the desired effect was certainly achieved.

### **Quaint station buildings from wood**

The prototypically steep 6% grades result in shorter trains. Which allows for smaller station trackage, especially the St. Peter-Molinis station was, prior to expansion, one of the shortest stations. The station buildings are built of wood in the Chalet style. Many of them are some distance from the village/town which saves building a lot of structures. Those I'll need to build for Chur and the surroundings at Arosa. The structures will be grouped rather than scattered and by that the distances on the layout appear larger.

Chur and Arosa at either end of the line feature larger station trackage which can handle longer trains. Station trackage follow the arrangement on the prototype. Being as every turnout presents a potential derailment problem, because of loose leaves and ballast, there are quite a few "dummy" turnouts. They have the same appearance as a turnout, but none of the functions. Point rail as well as frog are a solid, continuous rail, nibbing derailments in the bud. This type of turnout can be scratchbuilt from ties and rail profile at an extremely low cost.

### **Battery operations without regrets**

Being as there are no services to the property and battery operation has proven itself, I use lead batteries. Control is through a Graupner MC 16/20. The control is intended for model helicopters and for that reason much too "smart" to operate a garden railway. However it is the only control which has proven to be absolutely 100% reliable. Analogue RC suffers from all types of glitches on account of the catenary which shields (or soaks up) the signal. The running voltage is limited to 6V, which is routed from the battery via the throttle directly to the motors. There is enough power for the trains to reach the prototypical 25kmh(15mph).

The advantages of this system are: no cleaning of the brass track required, no voltage drop as a result of rail joints, no intermittent contact at the turnouts; a big PLUS for larger layouts. Being as all engines are fitted with the same type of receiver (same frequency), there are provisions to cut the power to each engine. Operation approximates the prototype's, most of the passenger trains - including the Arosa Express - are run as

push-pull trains with pilot cars at the Chur end. This ensures that the train is always stretched rather than having to worry about run-in of slack. Freight and service trains are added as required. This lets me decide if I would like to do switching or just watch the trains while they roll along. To increase the scale factor I have advanced to the tweezer coupling system. All of the cars have been converted to scale couplers, the slack in the coupler is adjusted with small chains. Only the passenger train units, which always run as a consist, have standard couplers within the consist. Turnouts are hand throw types for lack of auxilliary power.

### **Bonsai sets the tone**

As mentioned the layout is a large bonsai garden. Bonsai means "tree in a bowl"; however I was mostly interested in the trees and their shaping. There are no bowls. Bonsai isn't just a miniature tree, rather it is the art to suggest a complete landscape by using a tree. On the garden railway there was first space to be filled, in my case approximately 500m<sup>2</sup> (5500sqft). Some portions of the layout were covered in artificial turf with drainage holes which tend to grow in with moss. For bushes and undergrowth I use Scotch heather, as well as Cinquefoil and some types of Cotoneaster. All ground covers need an annual trimming prior to setting new growth.

Any plant of the woody variety can be used for Bonsai. To keep with the mountainous theme I use mostly conifers: pines, tamarack, juniper and yew. For deciduous trees I use maple, oak, beech, birch and hornbeam. Cotoneaster can be used to represent fruit trees, in the Fall it carries small red fruit and has nice small foliage. The fruit trees are plated near the towns.

Conifers lend themselves very well for Bonsai, by using "dead branches" they will represent old trees. These types, which nature shaped over many years, I plant on steep rock outcroppings to accentuate the mountainous terrain. At last count there were about 250 of the Bonsai trees. The deciduous trees require constant clipping and shaping, conifers on the other hand get plucked. During the month of May this means lots of hard work.

The complete layout is fitted with

scratchbuilt catenary, which works very well. The actual function is limited to the mechanical contact between the wire and the pantograph, propulsion power comes from the onboard battery in the engines. Using the catenary as power feed would have been impossible as it is interrupted at each of the walkways. Otherwise it would have ended up as dangerous trip wire.

At each walkway the bronze wire moves up and ends, this allows the pantographs to move off and back on to the wire without entanglements. The proper functioning depends in large part on the minimal pressure of the pantograph, which is adjusted to slowly move up when the wire ends. All pantographs have a safety feature which ensures that the pantos will be released if they hang up. This precaution helps to keep pantographs and engines undamaged.

### Scratchbuilding in 1:24

I scratchbuilt almost all the rolling stock in 1:24 (1/2"/ft). Due to the slightly smaller scale - when compared to 11m - even the long coaches could be built to

scale without having to enlarge the tunnel clearances or the placing of the catenary masts to gigantic proportions. This prevents me from using R-T-R rolling stock, but I really enjoy scratch building. All rolling stock needs to negotiate 1170mm(3.8ft) minimum radius.

The scratchbuilding materials include different types of plastic, aluminium and brass. The power blocks are mostly LGB, being as they have proven themselves in the harsh garden environment. Thanks to many years of prototype research I find the required information in my own RhB archive. My favourite projects are engines. Precisely for the Arosa theme one can use the motivepower of years gone by (DC system) or today's AC engines, which allows considerable latitude. The latest completion is the Ge4/4" 628 with the modern, rectangular headlights. This allowed replacement of the "too large for my scale" LGB product.

Worth mentioning is the modelling of a ballast compacting machine, a project which spent several dormant years in a drawer. Finally I had my wish of a MATISA B 24 C, as is now in use on the RhB. The non-power model of

service equipment is quite a sight within a freight train.

The pilot cars are other items which have their allure, especially since they present different "faces" at the end of the push-pull trains. In the meantime three of them have been built, one in the flowery livery of the Arosa Express, a second one from the DC era and as latest addition the type with the low-entry feature; this car sees occasional fill-in duty on the Arosa line.

There's still much to do on the layout. But I wouldn't have it another way for fear of getting bored. The Chur building phase requires a lot of stamina, because of the number of required structures. There are also plenty of ideas on how to improve the scenery. I would also like to add more detail to the station areas.

Unfortunately some havoc and destruction is caused by both birds and martens which will call for additional technical solutions.

And next winter, when the snow flies and everything comes to a stand still, there will be one or more pieces of rolling stock abuilding.

POLA's Relief buildings

## No half measures... Page 54

How often does a a well-detailed miniature world end at a very plain fence. Low-relief buildings are not just for the edge of the layout. We took a closer look at the new POLA product.

Wouldn't you like a few more structures in the garden but simply lack the space? Is the plain wooden wall, which keeps things out of sight, bothering you?

These and similar question must have been on the minds of the designers at Faller, when they went about creating the new POLA structures. As far as the quality goes they are typically POLA: parts that fit and have reinforcing

alignment pins. The three outer walls get sufficient stability from the solid roof, which saves attaching the rear wall. If you should or shouldn't needs some consideration. We're getting there right away.

The structures lack a base. Which is OK for indoors, but in the garden we recommend against it for two reasons: the narrow, high houses can easily fall over, especially if caught by a gust of wind. Protruding parts like the eavestroughs and downspouts are then easily damaged if the structures falls towards the front. If you prefer a solid base and plan on gluing the structure to it, you can simply insert

the backwall into the slots of the sidewall. This allows you to clean inside. The interior of the display window, with all the extras, can just as quickly and easily be removed if you don't glue it in place.

If you prefer to fix the backwall in place you should add a bead of silicone to the gap between the roof and the wall, to prevent the ingress of dirt and moisture - the roof overhang is missing in the back. Add a small hook to the backwall about a foot from the bottom, that will make it easier to fasten the structure.

## 280W of Power... Page 55

If you are running long trains with lit cars and more than 3 motors in the garden you know the problem: the power pack quits abruptly after one loop, some of the cars derail.

The only way to fix it is a larger powersupply. The CRE-55465 Elite from Aristo-Craft is an alternative to the European power supplies since the input voltage can be selected (110V or 220V). The output DC voltage is adjustable to either 22V at 13A or to 13.8V at 20A. This is enough for large garden railways as well as huge indoor layouts in the smaller scales.

The switching power supply delivers clean DC without spikes, it regulates the current according to demand i.e. MU lash-ups and several engines on a grade will cause no voltage drop (if within the overall capacity of the unit). The unit has short-circuit protection, however it will also automatically reset, which will pose a problem in cases of derailments. George Schreyer, the LS technical guru, determined that the unit delivers up to 372W under those conditions. Tests with our Train Engineer showed that following derailments the 10A fuse would pop, thus protecting the TE from harm. Any

controllers or DCC systems connected to the Elite will require a fast acting fuse or overload protection.

The drawn current is shown on an Ampère meter. A built-in fan protects against overheating. Most garden railroaders won't use the full capacity of this reasonably priced unit.

We recommend this unit, provided the connected control elements are properly protected.

Lenz presents its surprising USP technology

## Excellent recall... Page56

No battery, no live steam - and yet the engine moves across the sheet of blotting paper on the track. Instead of paper it could be dirty track. Did Lenz find the solution to make running with track power trouble free?

Christian Tietze shines some light on the new technology.

The power for our modelrailroads is mostly DC - apart from the time proven AC system that Märklin uses - at up to approx. 20V and one rail each of the track serves as the plus and minus pole. A known problem is power pick-up on dirty track as well as the insulated frog sections of turnouts. Without doubt this is more critical in Z and N scales than for instance HO. On garden railways there is the additional weather component that leads to oxidation of the track, as well as fallen leafs and additional dirt and grime. Tried and true measures against stalling are multiple power pick-ups through as many wheels as possible, three-point suspension (perhaps even sprung wheel sets) of the drive train to have all wheels kept on the rails and flywheels on the motor shafts. Luckily most manufacturers have realized that only well-balanced flywheels will achieve the desired smooth running characteristics, especially on engines that use worm wheel drives to achieve the required gear ratios.

But even the best flywheel/motor combination will reach its useful limit on

longer stall points, because the stored mechanical energy is directly proportional to the square of the rpm i.e.  $n^2$ ! Coasting distance will be reduced to 25% if the speed is reduced by 50%.

The solution: an electrical storage device in conjunction with uninterruptable data transfer (USP) as developed by Lenz for modelrailroad applications. The concept requires two components:

— the flywheel (mechanical storage of energy) gets supplemented and in some cases replaced by an electrical storage device i.e. a battery or better yet a large capacitor.

— the data transfer has to continue without interruption in order to prevent decoder glitches i.e. there are no data errors, the decoder does not reset. This is precisely the point where Lenz's UPS (Uninterruptable Signal Processing) system enters by using an "intelligent" circuit which is an integrated part of the decoder.

What used to strain credulity was being demonstrated at the Lenz booth at the Nürnberg Fair: An Atlas O-scale engine (Lenz distributes Atlas in Germany) rolled onto a sheet of blotting paper, remained there without power for more than 30 seconds and then accelerated gently following a digital command. The propulsion power was stored in a "capacitor-battery" which stores a hitherto unheard of 2.5F (Farad) -

a huge amount when compared to the standard capacitors which are rated in microfarads.

The new generation of capacitors goes by the name of "Supercap", distributed by Epcos (subsidiary of Siemens). Lenz assembled an array, using the basic unit with 2.3V rating at 5F and switching several in parallel and series arrived at 9.2v and 2.5F. All this within the 25 x 45 x 18mm dimensions. At as little as 9V the energy calculate as follows  $E=1/2C \times U^2$  ( $1.25 \times 81 = \sim 100Ws$  (Wattseconds) and this independent of the speed the engine was running at.

In real life it is unlikely that garden railroaders encounter stall spots in Letter size dimensions, which means a tenth of the energy will probably suffice. Considering the resulting dimensions this could be of use to HO modelers. What will determine the required capacity are such auxilliary functions as lights etc.

A word of caution: the capacitors can not simply be switched in parallel to the motor, they are uni-polar and would fail as soon as the direction was reversed. The circuit requires a full-wave bridge which is integrated in the Lenz decoder. As mentioned the USP-ready decoder has a special input circuit which enables the decoder to gather the signal from the isolated track (either dirt or the blotting paper) using capacitive means. To achieve this intelligent use is made of the minute capacity that exists between the

track and the engine (in the Nanofarad range) and which the DCC signal at 4.5 or 9 kHz uses as a transfer bridge. In

addition the USP feature will enhance the data rate which will require fewer repeats of the data and increase the transmission

reliability.

Therefore the USP technology represents a positive advance, even without the

Powering up after the winter hiatus

## Forget the crawl... Page 58

That's what you were looking forward to: the first run after the winter. And then you get the snail's pace performance of trains that seem to have the hiccups. There's a fly in the ointment. But where?

Bernd Harjes and Michael Kuseli show even the "electrically challenged" how to look for trouble spots on your garden railway and how to prevent recurrences.

First a few of the basics to help grasp the problems impeding smooth operation in the garden. Rather than providing current, we provide power i.e. a voltage and a certain current capacity. Multiplying the two values one arrives at the output which is given in VA (voltamps) or W (watt). The output of the engines is often quoted in VA (Note: North American practice denotes current consumption in A, instead of VA), the sum of the output of all operating engines governs the capacity of the power pack i.e. 30VA.

The path of the energy (picture 1) in a bare bones system is from the secondary side of the power pack (12... 16... 18... 24V) through connectors 1, the cable from the house to the track, the connectors 2 at the track, the rail joiners 3 on the track, to the wheels 4 and the pick-up shoes; finally to the motor 5. Depending on the make there are up to 20 connecting points to negotiate. At all points noted on the drawing there will be some type of resistance which can lead to problems. In the garden it is mainly the cable connectors and the rail joiners. A break in any one of the connections can result in loss of power. Is it only one rail joiner then the train will slow after that joiner. The reason there is a voltage drop i.e. the voltage at the engine is lower than at the power pack. The severity would increase with each faulty rail joiner until the engine would be barely crawling.

Adding a second feeder at the other end of the track would lessen the

problem. A hint that properly placed feeders will eliminate most of the voltage drop on a garden railway.

### Power distribution: The tree

Our track has several distribution blocks (picture 2), several branches of cable run from the power pack to the blocks; when using DCC the blocks are supplied by a booster. The system has some advantages:

- simple wiring
- low cost
- easy trouble shooting. If there is a short circuit it is easy to determine the source by measuring the current of the different branches. If an engine stalls in one block there are relatively few fault possibilities( i.e. faulty joiners).
  - lower short circuit current: The current flow path being given - power pack to fault site - the short circuit current will be within tolerable limits. And it will be limited to the block in question rather than the whole layout. The commercial power packs usually have an automatic circuit breaker which will shut down.

Unfortunately there are some drawbacks to the system:

- poor voltage regulation: the farther an engine is from the power pack, the lower the available output and as a result the engine slows.
- poor supply safeguarding: being as the layout, or parts there of, rely on a single power source an interruption in the distribution line will result in a loss of power.

To eliminate these drawbacks a "closed loop" distribution is a better alternative. How does one realize that?

### First choice: Closed loop distribution

From a power pack (booster in the case of DCC) power is supplied to either

end of a track which in effect creates a loop. This will provide better voltage levels (less voltage drop) the engine will receive full power. Should the one feeder fail it is still possible to maintain some semblance of operation with the remaining feeder. As there isn't one clearly defined current path, trouble shooting will be more of a chore.

### Proper power distribution on a garden railway

Combining the tree scheme with the closed loop scheme will result in what's shown in picture 3. The layout is divided into two tree systems by insulator 5. Return cable 2b (this is the common rail) should have as many feeders as practical, this will jumper most of the faulty rail joiners. In the process eliminating the "crawl" syndrome.

Trouble shooting is easy i.e. short circuit or open connection can be traced by following the separate feeders. To improve that even voltage level one can connect the two trees by bridging insulator 5 with a switch. This will equalize the level on both trees. For trouble shooting one disconnects the two trees with the switch at 5. Points "6" mark the locations of amp-meters to determine the current flow. Powering down the layout, disconnecting the feeder at "6" and then testing each feeder in the tree with an Ohm meter will make it easy. A short circuit, such as indicated in the left tree, will show zero ohms resistance, whereas the normal condition (on the right tree) will be "infinite" resistance.

### Connectors at the track

These theoretical examples should help to determine likely fault sources. However, the mentioned contact problems at the track remain and due to the high resistances involved they affect the output in a negative way. This requires some fundamental consideration.

Perhaps you noticed on other layouts, connecting cables (usually copper) are soldered (lead-tin alloy) to track (brass). This should set off alarm bells: due to the atmospheric conditions (aka pollution etc.) these connections will have a high corrosion factor, starting with the galvanic action. As a result the inferior element will start to disintegrate. You will observe that the solder will gradually turn white and start to detach from the rail. Someday the joint will fail and spoil your operation. Therefore it is better to choose fasteners which match the rail material. Using galvanized steel screws will create similar problems, the screw will start to rust. Only stainless steel screws are more or less immune. The commercial railclamps prevent this type of problem, coating them with graphite on installation ensures longevity. This will prevent the ingress of moisture, the same moisture that will lead to a joint with high electrical resistance. Even the commercial railjoiners that consist of brass joiners and screws will benefit from the graphite treatment.

### **Checking the circuit: A light bulb will do**

To return to the Spring preparations. To avoid unpleasant surprises it is recommended to check all parts of the layout. Start at the power pack in the house - using a powerbar with an indicating light is recommended. This should take care of the 110V side. If you decided to go with the tree system, check each of the branches with a multimeter.

However you don't necessarily need a meter, a 24V lightbulb will do in a pinch. If all checks out (the values on the meter have to be identical as there's no load) you can start with a test run. This is when the surprises will pop up.

Most often the engine will start and then stall. The cause is the high resistance between track and wheel. Brass track is notorious for this due to the oxidation. The oxidation is an insulating layer of a few 1/1000 of a millimeter, but heavy enough to prevent the 24V (as stipulated by the DIN/VDE standards) from reaching the wheel. If you now decide to check the voltage you'll find that scratching the layer of oxide (unintentionally with the tip of the measuring probe) will show the proper voltage. Of course this doesn't solve the problem.

The quick solution is cleaning the track, either with a track cleaning vehicle or by hand. In either case use only very fine wet paper. To follow this by an application of smoke fluid is not really recommended. Using an abrasive to clean the track also means creating fine scratches in the rail in which dirt and oxide have an even securer hold. Using stainless steel track avoids this problem, however one still needs to remove dirt and grime from the track.

If the engine still doesn't budge it is time to inspect the rail joiners. You could check the resistance, but most often the effort isn't worth the trouble. What's at fault here is corrosion which needs to be removed. Either disassemble the track and clean the joiners, or install wire

jumpers.

### **Current leaks: A bother, but easy to detect.**

After a long winter there could be some frost heave and the track needs to be readjusted. This can lead to failures of the rail joiners.

Dirt that has been washed into the track can cause current leaks, small currents which use the dirt as a conductor between the rails. If you measure at "6" in picture 3 you will get a current in the milliAmp range (picture 5). There is no real concern here as the power pack has enough power to compensate. However there could be glitches on layouts that use automatic train control devices such as "station stop" or the "back and forth" modules. As a most minor effect the duration of the station stop will change. To remedy the condition clean the track to remove all earth that contacts the rail. It is easy to measure current leaks, most often it is sufficient to measure the resistance between the rails. The values are in the Kilo-Ohm range, if there are no current leaks the values should be in the Mega-Ohm range.

Current leaks can create havoc on DCC powered layouts if incorrect data is generated i.e. an occupancy signal could be triggered due to the relatively low resistance. The current leak through the soil will be the culprit.

Following some of these recommendations should make for a smoother Spring startup. Happy rails!