



Getting started in Garden Railroading

HOW TO CHOOSE A SCALE

Navigating the options for large-scale railroads

by Vance Bass | Albuquerque, New Mexico

Photos by Marc Horovitz

Most of us have had this experience as we got started in garden railroading: You go to the hobby shop or scan the ads in *GR*, looking for equipment for your new railroad. It's all large scale and it all looks good. But the more you look, the less comprehensible your choices appear. What at first seemed like a huge range of choices begins to look like a carnival hall of mirrors. Nothing is what it seemed at first, things appear to be different sizes than you remember them, and you feel lost.



Common scales of large-scale trains

Ratio	Metric scale	Decimal scale	Fractional scale
1:13.7		.875" = 1'0"	7/8" = 1'0"
1:19	16mm = 1'0"	.629" = 1'0"	
1:20.3	15mm = 1'0"	.591" = 1'0"	
1:22.5		.533" = 1'0"	
1:24		.500" = 1'0"	1/2" = 1'0"
1:29		.414" = 1'0"	
1:32		.375" = 1'0"	3/8" = 1'0"

In the world of large-scale trains, several different scales of train can run on the same gauge of track. It's important to know what's what. Here, a 7/8"-scale (1:13.7) model of a 2'-gauge quarry locomotive by Martin Sheridan (right) confronts a 3/8"-scale (1:32) Aster model of a standard-gauge engine. Both run on (and are correct for) 1-gauge track—but not at the same time.

I have a shelf in my garage with the “stray dogs” I picked up in my early years as a large-scale modeler—items of indeterminate scale, the wrong scale for my railroad, or no consistent scale. They looked good in the store but not on my railroad, and I didn’t know enough about what I was buying to tell the difference beforehand. I once chopped an engineer figure off at the knees because he was too tall to fit into the cab of the locomotive I wanted him in. It turned out that he was a 1:22.5 figure and the locomotive was 1:32 scale (see photo 1). If I had only known!

Your life as a railroad owner will be much easier and more enjoyable if you make an informed choice about what kind of railroad you’re going to model and what kind of equipment is going to be appropriate for that railroad. This decision involves, in the early stages, choosing a scale in which to model.

Most of us eventually figure this out as we gain experience in the hobby but it really shouldn’t take that much trial and error, if only someone would lay it all out logically. So, we’ll give it a try here, hoping that this will save some readers from annoying—or costly—mistakes as they begin to acquire equipment for their large-scale railroads.

What are “scale” and “gauge?”

In order to make sense of it all, we must first examine the concepts of scale and gauge. If you’re already familiar with these ratios, you can skip this section and jump to the next.

Scale refers to the ratio between the size of your model and the size of the real thing (figure 1). If you’ve built plastic model cars or airplanes, you’re familiar

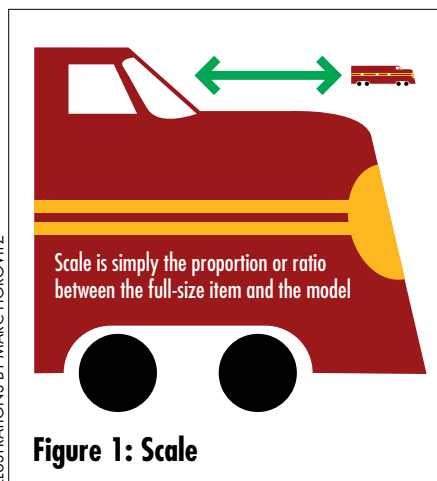


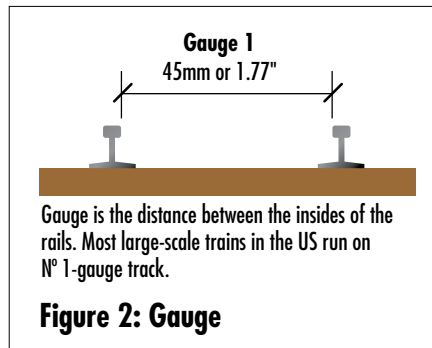
Figure 1: Scale



1. This 1:20.3-scale figure may look right for this 1:32-scale locomotive but if you tried to put him into the cab you’d quickly realize your error.

with scales like $\frac{1}{24}$ or $\frac{1}{48}$. Doll house and miniatures makers commonly use $\frac{1}{12}$ scale. These fractions simply tell how much smaller the model is than the real thing. Take your Toyota and shrink it to $\frac{1}{24}$ its original size and you’ll end up with a $\frac{1}{24}$ -scale model. Or, a 24" wheel in $\frac{1}{24}$ scale is (surprise!) 1" in diameter. Usually, model railroaders use the “ratio” method of writing this fraction, so when you see 1:29, you can substitute $\frac{1}{29}$ to find how much to multiply or divide by.

Gauge refers to the distance between the insides of the two rails on the track. Full size standard-gauge track (the stuff that runs through your town) is 4’8½" between the rails. The reasons why such an apparently bizarre number became the standard are lost in time and mythology, but many builders chose more rational figures. Some railroads were built with



Gauge is the distance between the insides of the rails. Most large-scale trains in the US run on N° 1-gauge track.

Figure 2: Gauge

narrower tracks (e.g. 2’, 3’, 1 meter), and some with wider tracks (e.g. 5’0").

The gauge of our model rails is 45mm, or 1.77", or N° 1 gauge in the terminology Märklin devised around 1890 (figure 2).

The term “G gauge” is sometimes incorrectly used to denote anything that runs on 1-gauge track. This is a primary source of confusion for buyers. The track is “1 gauge.” There are several scales that run on 1-gauge track (see the “Common scales” chart). Find out what the scale is before buying!

Given that we are using 1-gauge track, then finding the scale of our models is simply a matter of dividing the real gauge by 1.77". If we divide 4’8.5" by 1.77" we get 31.9, which we round to 32, making the scale of standard gauge models 1:32. Likewise, 3’ narrow-gauge models work out to 1:20.3 and 1 meter narrow-gauge to 1:22.5 scale (photo 2). There are also modelers who model 2’-gauge prototypes either on 0-gauge track (in 1:19 scale), or



2. These three models are all of similar prototypes—3’-narrow-gauge boxcars. In the foreground is an early Hartford Products car in 1:24 scale; in the middle is a Bachmann boxcar in 1:22.5 scale; and in the rear is another Bachmann car, this one in 1:20.3 scale. All run on gauge-1 track but only the 1:20.3-scale car is the correct scale for that gauge.

Table 1: Advantages and disadvantages of the various scales

Scale	Advantages	Disadvantages
1:32 (standard gauge — also called “N ^o 1 scale”)	<ul style="list-style-type: none"> • Correct ratio for standard gauge • Easy numeric conversions in feet and inches • Also used for farm toys and by military modelers • Many vehicles available • Many buildings available • Many human figures available • Some metal detail parts available 	<ul style="list-style-type: none"> • Comparatively little ready-to-run US equipment available
1:29 (standard gauge)	<ul style="list-style-type: none"> • Easy conversion from HO-scale plans (multiply 1:87 scale by 3) • Much ready-to-run equipment available • Some buildings available • Some human figures available 	<ul style="list-style-type: none"> • Trains look slightly too large relative to track • No vehicles available • Few or no metal detail parts available
1:24 (narrow gauge)	<ul style="list-style-type: none"> • Easy numeric conversions in feet and inches • Also used by architects, doll house and miniatures hobby • Lots of structures available • Many vehicles available • Many human figures available • Many metal detail parts available 	<ul style="list-style-type: none"> • Little ready-to-run locomotives or rolling stock • Trains look too small relative to track
1:22.5 (narrow gauge — also called “G scale”)	<ul style="list-style-type: none"> • Correct ratio for 1-meter narrow gauge • Much ready-to-run equipment available • Many buildings available • Many human figures available • Some metal detail parts available 	<ul style="list-style-type: none"> • Most equipment in this scale is of European prototypes • Some of the ready-to-run equipment (e.g. US prototypes) should be in other scales, so looks too large or small relative to track • No vehicles available
1:20.3 (narrow gauge — also called “F scale”)	<ul style="list-style-type: none"> • Correct ratio for 3' narrow gauge • Much ready-to-run equipment available • Many metal detail parts available • Can use some 1:19 items where appropriate 	<ul style="list-style-type: none"> • Few vehicles available • Few human figures available • Very few buildings available
1:19 (narrow gauge — also called “16mm scale”)	<ul style="list-style-type: none"> • Correct ratio for 2' narrow gauge on 0-gauge (32mm) track • Much ready-to-run equipment and kits available (UK/Europe) 	<ul style="list-style-type: none"> • Almost entirely British or European prototypes
1:13.7 (narrow gauge — also called “7/8n2 scale”)	<ul style="list-style-type: none"> • Correct ratio for 2' narrow gauge on 1-gauge track • Many metal detail parts available 	<ul style="list-style-type: none"> • No ready-to-run equipment available • Very few human figures available • No vehicles available (though 1:12 scale could be used in many cases)

on 1-gauge track (in 1:13.7 or 7/8" scale). Luckily, ubiquitous pocket calculators have made these screwball ratios easy to deal with.

Finally, there are a couple of other widespread scales that were derived, not from the exact ratio of the gauge, but from other considerations. Early in large-scale days in the US, 1:24 was a popular scale. Our 1-gauge track works out to 3'6" in that scale, a fairly common gauge world-wide, and used here and there in North America. That scale is not one many people choose to model these days, though some model equipment designed in the 1980s lives on (without the obsolete scale designated on the box). Also, many metal detail parts are still available and many

buildings are still made to 1:24 scale so they can use doll house windows and doors. Instead of the more correct 1:32 scale, most standard-gauge models are now made in 1:29 scale, reportedly so they wouldn't be dwarfed by narrow-gauge models on the same track, even though the prototypes were larger. The scales don't match the gauge of the prototypes but, if everything else on the railroad is consistent in scale, it's not something most people find objectionable or even noticeable.

How to choose a scale

With those preliminaries out of the way, let's look at the various scales available and list their characteristics, with an eye

to finding their advantages and disadvantages. As mentioned above, the thing that will spoil the look of a railroad fastest is having a mixture of different scales that clash visually.

Railroad cars were not all identical, so running 1:20.3 scale with 1:22.5 scale, for example, can work in some cases, but generally you can immediately spot a car of the wrong scale in a train. Mixing scales also frequently leads to operational problems, as the couplers may be at different heights, the wheels may have different flange profiles, etc. Armed with this data and your preferences and circumstances, you should be able to start your railroad knowing exactly what you're getting and why.

Table 1 looks at the scales from the standpoint of what it takes to build a complete, visually coherent railroad. That means a range of appropriate rail equipment (locomotives and rolling stock), as well as the things that justify having a railroad—buildings, vehicles, and the people that use them. There are also less tangible characteristics, such as the “correctness” of the scale to the track gauge, which can be a subtle visual cue, or the ease of working with the scale when scratchbuilding from plans.

It also assumes that you are modeling a North American railroad. Those modeling UK or European railways can, of course, disregard any stated disadvantages regarding prototypes. Although the assumption is that you are using 1-gauge track, I include 1:19 scale here (without any details) because its closeness to 1:20.3 permits running both 3' and 2' narrow gauges in the same environment (photo 3). If you're interested, this is a very popular scale in the UK and hobby magazines there cover it extensively.

When choosing the scale for your railroad, ask yourself what you want out of it, and what you want to put into it. Do you want your railroad to be a convincing representation of a real one or do you just want to give the general impression of a real railroad? Do you like steam or diesel locomotives? Do you like mainline railroads, or little short lines and narrow gauges? Do you want to use everything right out of the box, scratchbuild as much as possible, or something in between? Do you want to build large cities or just have enough houses to suggest human habitation? If there are no buildings in a particular scale and you hate the thought of scratchbuilding them, then that scale may not be a good choice for you. Think through everything you might want to include in your railroad, how you want it to look, and how you want to obtain it, and then compare those preferences to Table 1. You should be able to weed out the bad matches and come to the one that suits your style best.

Scale rulers

Although some of the scales have “ease of plan conversion” listed as an advantage, this is really a hold-over from the 1970s or before. The scale of 1:32 (1:32 or $\frac{3}{8}$ " = 1'0") is also used by architects, so it was

already familiar to many modelers. And this is also why there are so many cars, buildings and figures available in 1:24 scale ($\frac{1}{2}$ " = 1'0")—it's another commonly used architectural scale, as well as the scale used for plastic car models and many doll house miniatures.

Once pocket calculators (and cell phones and computers) became affordable to everyone, though, the conversion issue became almost irrelevant. And someone invented a tool called a “scale ruler,” which looks like an ordinary ruler except that the markings are feet and inches in your modeling scale (photo 4). These have been available in architectural scales for decades, but now you can also buy them in any model-railroading scale you can think of, so you can measure an 8' board in, say, 1:29 scale directly on the ruler, rather than having to do the conversion to 3.31" (an awkward distance to measure on a conventional ruler anyway). Using a calculator or scale ruler, then, the “conversion advantage” disappears. Unfortunately, that hasn't made buildings, vehicles, or human figures more plentiful in the “odd” scales but at least you don't have to do fancy mathematics when you make your own.

Finding items in your scale

Once you have settled on a scale that strikes the right balance for you, you can then begin to assemble the pieces to build your railroad—locomotives, rolling stock, buildings, vehicles, and people. Some manufacturers are good enough to mark the scale of their products on the front of the box. They deserve our deep gratitude



3. This three-rail track incorporates two different gauges—0 gauge and 1-gauge. Trains in 16mm-scale (1:19) and 15mm-scale (1:20.3) are equally at home on these rails.

for this kind consideration.

Others decline to do so, for whatever reason. We can't just write them off, because some very good products suffer from this malady. When in doubt (that is, when it's not printed clearly on the box, or in the ad), by all means question the manufacturer or dealer about it. They should know or be able to find out easily, if they know their business. If they can't answer your question clearly and quickly, then avoid buying that product and look instead from something else (or somewhere else). Or, pull out your scale ruler and figure it out for yourself.

When it comes to buildings, vehicles, and people, you can sometimes use items from the “closest” scale to yours (e.g. 1:32-scale people with 1:29-scale trains). Since people come in a variety of sizes, they are

4. Scale rules are available in virtually every model-railroad scale (and many others as well). They make measuring in your chosen scale a snap and are equally useful for converting drawings in other scales to yours.

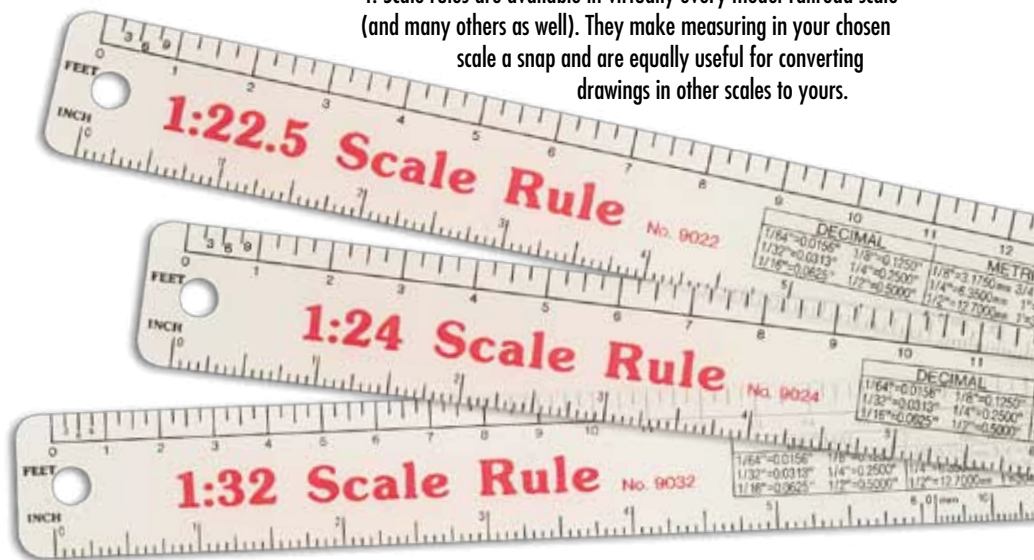


Figure 3: Comparative sizes of large-scale figures

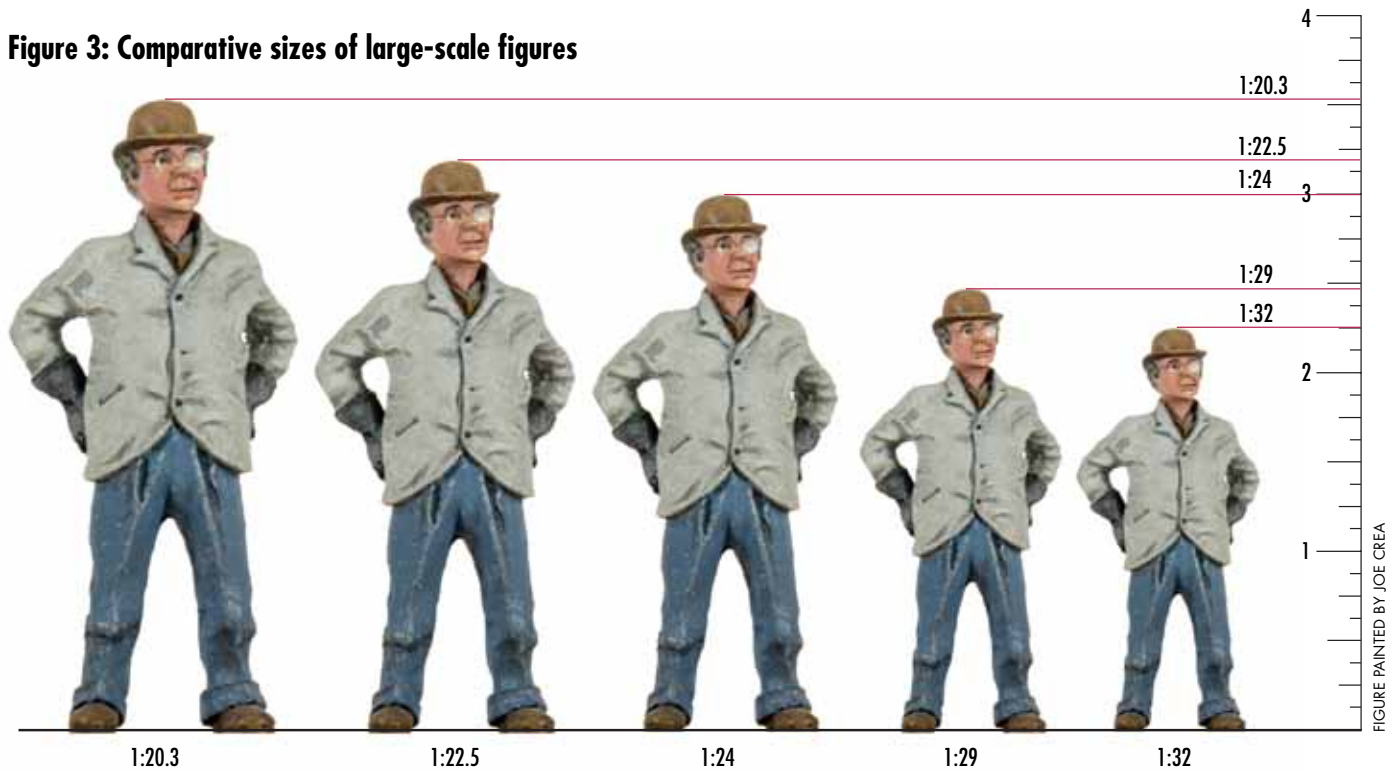


Table 2: Who makes what — a partial list

Scale	Train equipment and detail parts	Buildings, vehicles, people
1:32	Accucraft/American Mainline (steam, rolling stock) Aster Hobbies (live steam) Custom Model Products (steam, rolling stock) Märklin (European steam, diesel, rolling stock) MTH Rail King (steam, diesel, rolling stock)	Buildings: Wide variety available (although many are partially destroyed for military dioramas) Vehicles: Widely available in plastic and diecast People: Widely available in plastic and diecast
1:29	Accucraft/American Mainline (steam, rolling stock) Aristo-Craft (steam, diesel, rolling stock) USA Trains (steam, diesel, rolling stock)	Buildings: Aristo-Craft Vehicles: None People: Aristo-Craft
1:24	Accucraft (early steam) Aristo-Craft ("classic" steam, rolling stock) Hartland (steam, rolling stock) Trackside Details (detail parts)	Buildings: Huge variety from doll house and miniatures shops, garden-railway suppliers Vehicles: Huge variety available (plastic, diecast) People: Plastruct, Model Citizens Architectural details: Plastruct, Grandt Line
1:22.5	Bachmann (early rolling stock and locomotives) LGB (European, US prototypes) Piko (European, US prototypes) ProLine (European prototypes) USA Trains (rolling stock) Ozark Miniatures (detail parts)	Buildings: Piko, Pola Vehicles: None People: Bachmann, LGB, Preiser, Model Citizens, Woodland Scenics Architectural details: Ozark Miniatures
1:20.3	Accucraft/AMS (steam, small diesel, rolling stock) Bachmann (steam, small diesel, rolling stock) Custom Model Products (steam, small diesel, rolling stock) Ozark Miniatures (detail parts) Trackside Details (detail parts)	Buildings: Modeltown, Brandbright Vehicles: Hubley/Ertl (out of production), some diecast People: Model Citizens, Familiar Figures
1:13.7	Model Earth Design (RTR rolling stock) Sierra Valley Enterprises (RTR rolling stock) Ozark Miniatures (detail parts)	Buildings: Structures and architectural details available in 1:12 scale Vehicles: Widely available (1:12 scale diecast) People: Available in 1:12 scale from doll-house and miniatures shops

easiest to fit into multiple scales. Use a scale ruler or pocket scale card to determine the size of a figure in your scale (figure 3). Do this cautiously, though, because our eyes and brains are exceedingly sensitive to the human form. Buildings and vehicles are less flexible, since their sizes are more standardized and mismatches are therefore easier for the eye to detect.

Who makes what?

Table 2 gives an idea of where to go to find equipment in the scale you have chosen. It does not provide a totally comprehensive list but mentions the major manufacturers and some of the emerging ones. Unfortunately, it can't tell the whole story because some manufacturers don't make everything to the same scale and some do not label their products with a scale. The effect of this is to obscure the very information you need in order to make an informed choice. It helps to be able to take a piece out of the box and check it against scale drawings or to look at it next to your own trains, but that's not always possible. Product reviews in *Garden Railways* always state the scale of the item (where it can be determined) as well as comparing its dimensions to known prototype measurements.

Be careful when choosing equipment that is not labeled and about which you haven't read a review in the hobby press. Sometimes it's better to not purchase something you can't check out, rather than ending up with an unwanted piece of rolling stock for your "stray dogs" collection.

So, my advice is to choose a scale, insist on being informed about the scale of the items you buy, and stick to your choice. You'll have to pass up some things that your impulse tells you that you must have but your railroad will look and run better—and cost less—in the end. And instead of a "stray dog" shelf, you'll have nothing but equipment that looks and works well together, leaving you more money and time to enjoy your railroad, which is what it's all about. 🚂

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Material matters

“I’ll huff and I’ll puff and I’ll blow your house down,” said the Big Bad Wolf. Practical Pig, unmoved by Wolf’s incessant ranting, relaxed on the sofa. Unlike his two less fortunate friends, he understood about building to withstand the elements.

Perhaps this is stretching a fable a little too far, but the moral is the same. The first lesson we learn when we take our trains outdoors is that nature doesn’t play favorites. It will huff, puff, rain, shine, flood—you name it. Our only sensible action is to choose materials for our projects that will stand up to the forces of nature.

Plastic

Let’s start with plastic, since that’s what a vast majority of our trains are made of. “Plastic” is a generic term, for which there exist many variants. Most of our trains are

made of ABS, or Acrylonitrile Butadiene Styrene. ABS is very durable, with excellent working characteristics. It can be cut, drilled, and machined with relative ease. It’s also good for injection-molding, making it perfect for our trains.

ABS has a close cousin, commonly referred to simply as styrene, which has similar working characteristics, but is a bit softer and more flexible than ABS. Both are excellent choices for the modeler and readily available at most hobby shops.

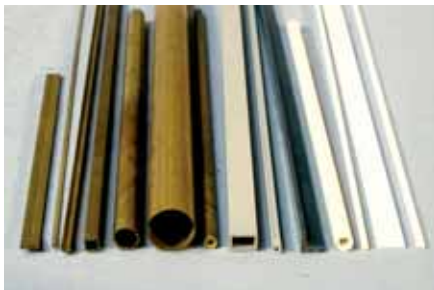
If you’re looking for clear plastic, acrylic sheet is the most common option. Lucite is a common trade name, as is Plexiglas. Another common clear plastic is Lexan, one of several polycarbonates.

There are some thicker plastic products available, best suited for structures. These include a product called Gatorboard, which

A multitude of materials is available for building structures and equipment for our garden railroads. Choosing the right one for the job will ensure the project will provide years of service.

consists of a core of expanded styrene foam sandwiched between two layers of thin styrene—essentially, a plastic version of foamcore. Another option can be found along side the road fairly easily—corrugated plastic sheets, commonly used for political yard signs and similar applications. Both these products are available from plastic-supply houses or possibly from a local sign shop.

Plastic is great for model building. It is one of the easiest materials to work with and can be made to represent virtually any other material. If you want it to look like metal, leave it smooth. If you want it to



Brass and plastic come in a variety of shapes, many similar or identical to each other. Generally, what you can build in brass, you can build in plastic.



Because plastic and metal have some similar qualities, plastic is often used to simulate steel cars. Here, the beams of the flat car were built from strips of styrene. Rivets were embossed in a thin sheet of styrene, which was then laminated to the outside of the beam.

represent wood, run some 60-grit sandpaper over it to add "grain." Cutting it is a "snap," literally. Just score a line along the plastic, then bend it until it snaps apart. No saws are necessary, unless you're doing complex shapes. If you must cut plastic with a power saw, use a sharp blade and a slow speed. That's one downside to plastics—they melt. Molten plastic will stick to a saw blade or drill bit, rendering it ineffective in a hurry. Keeping tool speeds slow will reduce heat build-up.

Plastic is a suitable material for almost any project, but is susceptible to damage from high heat and sun. If you're using it for rolling stock that you take indoors, you should have no worries. Plastic structures that are constantly exposed to the high heat of the sun have a tendency to warp.

Sunlight by itself is an enemy of plastic. The sun's ultraviolet (UV) rays deteriorate plastic. Unless the plastic has a UV stabilizer in its formulation, it will discolor and get brittle within a season. A coat of paint

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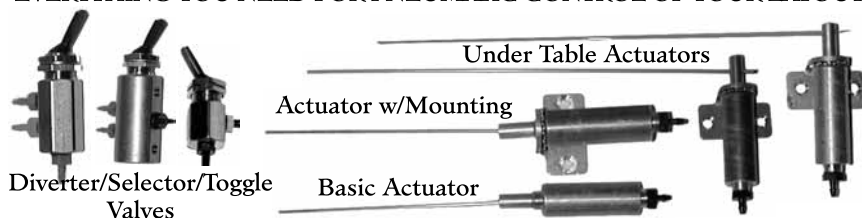
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will slow this process, but may not eliminate it completely.

Wood

The second most popular material for equipment and structures alike is wood. The hardest part, when dealing with this material, is deciding which wood to use

for what project. For kitbashing or scratch-building rolling stock or locomotives, any wood will work well (though I'd shy away from balsa, just because it's not strong). As long as the models don't spend a significant amount of time in the elements, the common "hobby" woods (bass, spruce, and mahogany) will work nicely. If the

model is going to spend most of its life in the elements, use a wood that will last, such as redwood, cedar, cyprus, or even pressure-treated lumber. Just as you wouldn't build a deck out of untreated pine, you shouldn't build a station out of wood that will quickly rot.

The biggest enemy of wood is water. While there are preservatives that will prolong the life of the material, wood will not last indefinitely. Preservatives must be reapplied from time to time, just like a protective coat of paint. Glues used to bond wood must also be moisture resistant. I've seen wood structures fall apart (rather prototypically) piece by piece, as the wood and the glue both deteriorate due to moisture. If the wood is in contact with the ground, extra care must be taken to keep the moisture away. Wood structures last much longer in dry climates.

It seems logical that plywood would be well suited for use in the garden, but you need to be careful as to which kind you purchase. Use only plywood designed specifically for exterior or marine use. The glues used to laminate the sheets together are much more waterproof than interior-grade plywood's. However, the label "marine grade" does not mean it's able to be exposed constantly to water. Wood is still wood, and will absorb water and rot. Like any other wood product, it needs to be painted or treated to protect it from the elements.



Redwood is more rot-resistant than other woods, making it a prime candidate for ties used in hand-laid track. It's still a good idea to periodically treat it with a preservative.



There's nothing wrong with mixing materials. The base of this hopper car is a commercial plastic hopper. The timbers are wood and the braces and details are metal, with the exception of the square, plastic nuts at the ends of the steel rods.



It's always a good idea to organize the raw materials in your workshop. A stock shelf like this allows you to quickly locate material of the correct size and type.

Metal

Metal is commonly used in model construction, more for rolling stock and bridges than buildings. The most common metal used in modeling is brass, though aluminum, copper, and steel also figure prominently. The biggest advantage to using metal for construction is its strength. Metal and plastic are similar in terms of how they can be worked. Techniques for cutting, punching, and shaping these materials are almost interchangeable. Metals, however, are more tolerant and capable of being bent to shape.

The most common fear people have in regard to working with metal is soldering. This is the most effective way to join two pieces of metal. It is a skill, and can sometimes require a torch to heat the metal to



Nothing beats concrete for strength and durability when it comes to buildings. This is a versatile medium that can be used as easily for bridge piers as for engine houses, like this one on Marc and Barb Horovitz's Ogden Botanical Railway.

the point where it will melt the solder. It is a bit daunting at first, but well worth the time to learn. A brass locomotive or freight car will last almost forever.

Concrete

The "big three" mentioned above comprise only the most common materials used for outdoor structures and rolling stock in the garden. Other materials are well suited for use in the garden, but are far more specific as to their applications. Concrete, perhaps, is the best example of this. As in the real world, concrete is best used for structures. Bridge abutments, piers, roads, and subroadbed frequent the list of concrete structures in the garden. Typically, these are cast in wood forms. Concrete has also been used effectively as a veneer over a substructure of styrofoam or other suitable material.

Materials not to use

There are a few materials that stand out as things not to use. Any paper-based product, such as cardboard, Homasote, or foamcore, top the list. Wood-chip products are also no-nos. Particle or chip board and

masonite are the most common, and will absorb water and quickly fall apart. Styrofoam can be used, but don't build anything out of unprotected foam with the expectation that it will be around in two years. The material doesn't deteriorate, but it's rather weak, not able to stand up to the constant barrage of the elements without something over it.

This list of materials is far from comprehensive. New products are constantly being brought to market, each designed to be stronger and more resistant to deterioration. Ask around and find out what other modelers in your area are using. Notice how various materials fare just around the yard. Are you replacing the boards on your deck every five years? Then perhaps you should stay away from wood for your outdoor projects. Is your plastic lawn furniture bleached out because of the sun? You may want to think in terms of concrete or wood for your structures. At the same time, don't be afraid to experiment with different materials. With care and proper construction, your railroad will be able to withstand whatever the Big Bad Wolf throws your way. **II**

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The right tools for the job, part 1

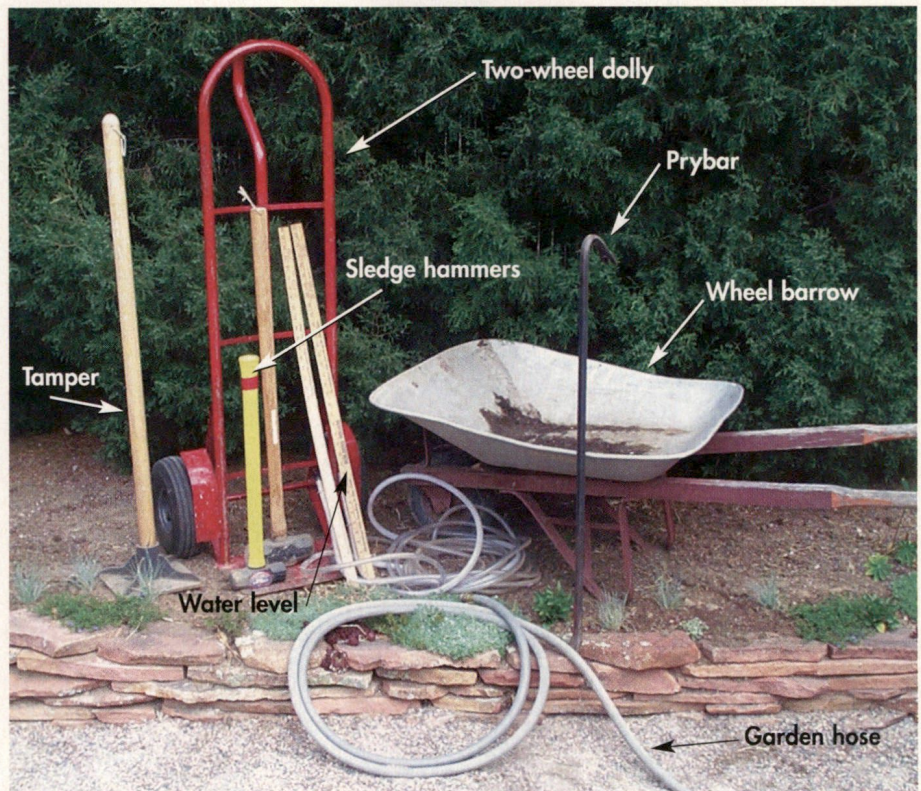
There is no single right way to build a garden railroad. There are, however, lots of wrong ways. The first step in heading down the wrong path starts with the tools you choose to do the work. In garden railroading, as in any other task, there are the “right tools” for the job. You will find your time spent in the garden much more productive when armed with the correct accessories.

Before we go into specifics, let me say a few words about quality and longevity of tools. In essence, you get what you pay for. You will encounter a myriad of products in an equally varying price range. I do not suggest that you fork over the money for the most expensive tool every time, but there are times when you will want to get the best tool you can. Oddly, though, this rule applies more often to the low-tech tools than the high-tech ones, as these are the ones you’re going to use day in and day out.

Basic tools form the backbone of your construction arsenal and should be up to the task. Most common garden tools are now available with fiberglass handles. Some even have padded handgrips. These are worth the added expense, as they are virtually indestructible and won’t rot if you leave them outside in the elements. They’re also a touch lighter. Make sure the business end of the tool matches the quality of the handle, though. This is especially important in small hand tools. Frequently, the very cheap ones are indeed that, in every sense of the word.

Secondly, don’t compromise on the number of tools you need. If the job calls for a left-handed monkey wrench, get one. Trying to “get by” with what is on hand often leads to disaster and a trip to the store anyway. Don’t think you have to purchase every tool though. Some specialized tools can be easily rented. Begging and borrowing also works well in garden-railroad circles. Some clubs have tool libraries for uncommon-but-necessary tools. You may even get some extra bodies to assist—perhaps the most important tools of all.

We’ll start by taking a look at the tools



Photos by Marc Horovitz

you are likely to need during the construction of the railroad landscape. You probably have some of these tools already. Others are a bit less common.

Shovel—either a spade or flat-bladed shovel will work well. Having both is better, as each has its own strengths. Flat shovels are good for edging and digging up sod. Spades are better for digging holes and moving larger quantities of dirt.

Hoe. A simple 6" garden hoe will do wonders for making sub-roadbed trenches and similar features. The width of the blade is almost perfect for that purpose.

A **mortar hoe** has a much larger blade, usually 10" to 12". This comes in handy when you need to smooth and grade large areas of dirt. It’s usually used to mix concrete, so when you have occasion to do that, the tool will already be at hand.

A **pick axe** is necessary for breaking up compacted or rocky soil. It’s also useful in tilling an existing garden area.

Pruners can be used for removing small limbs from trees. They are also useful for cutting away small roots that get in

the way of the sub-roadbed or other features of the railroad landscape.

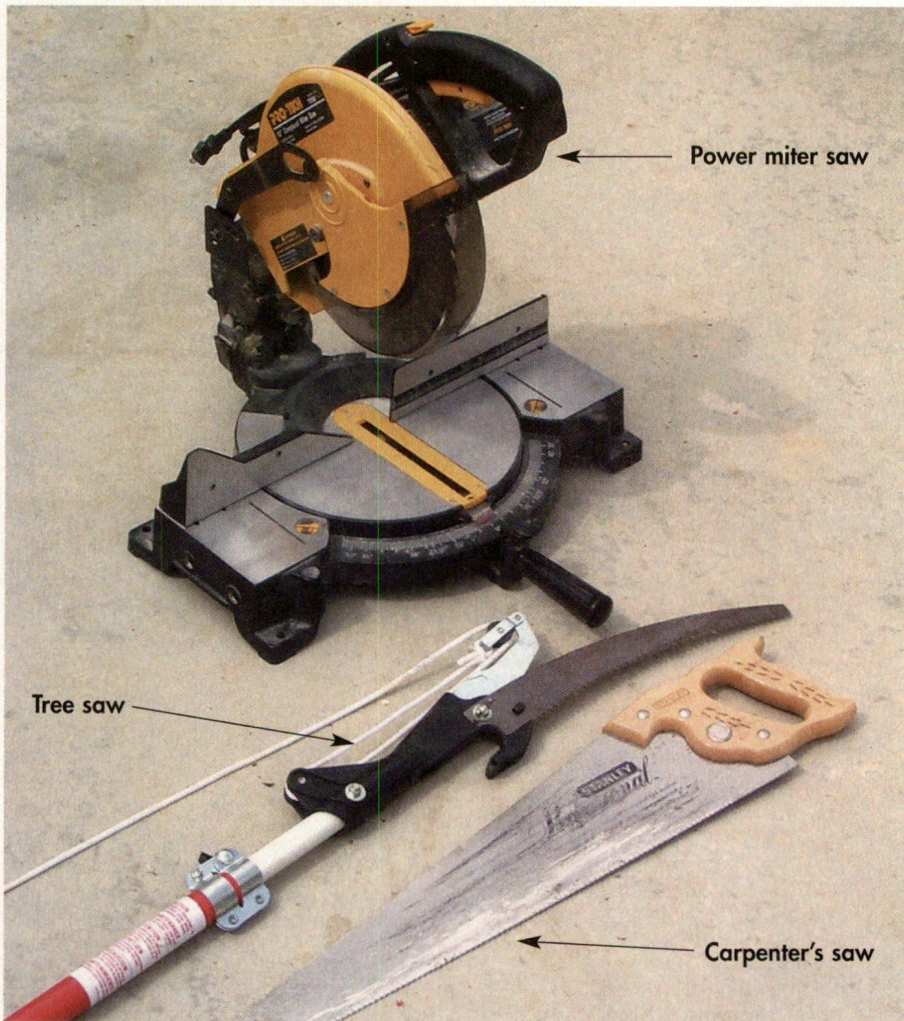
Leaf and lawn rakes are used, for the most part, for the final dressing up of the landscaping. A lawn rake can be used in conjunction with the mortar hoe for forming the terrain.

The **garden hose** is most obviously used for watering the garden, but it also comes in handy for laying out where landscaping features are to go. Many trackplans and ponds began as lengths of garden hose lying on the ground.

Wheel barrow. Be careful here. You may be tempted to buy the largest one you can find. Instead, get the largest one you can lift! Rocks and dirt are heavy. Overfilling a wheel barrow can lead to injury, not to mention spilled loads.

Gardening hand tools, including **trowels, hand rakes and tillers, weeders, a small scoop,** and **watering cans** are all necessary when it come to planting flowers and shrubs around the garden landscape.

Plastic buckets, like five-gallon paint buckets, are great for just about anything.



Tape measure. Distances in the garden often exceed the 25' of most metal tape measures, so you'll want to invest in a 50' or 100' tape.

Optical or laser transit. I don't recommend running out and purchasing one of these, unless you intend to start moonlighting as a surveyor. You can rent one from most tool-rental stores, though. They are probably the most accurate way of determining the topography of your yard, but not absolutely necessary.

A **water level** is an inexpensive surveying device. These are available commercially, but can be built even more inexpensively with two yardsticks and a length of clear plastic hose (the hose should be at least 1/2" in diameter). Using this tool is a good way to figure out height differences in the yard. Besides being cheap, a water level is easy to use.

Spray paint is great for marking where various features will go in the garden. You can buy cans designed to be sprayed upside down, in a variety of colors. A drawback to spray paint is that it is not very permanent. Once you mow the lawn, the marks are gone.

Garden stakes or flags is a more permanent way of marking where certain features will go. When bringing in dirt, these stakes will allow you to see where the dirt needs to go and how high it needs to be brought up.

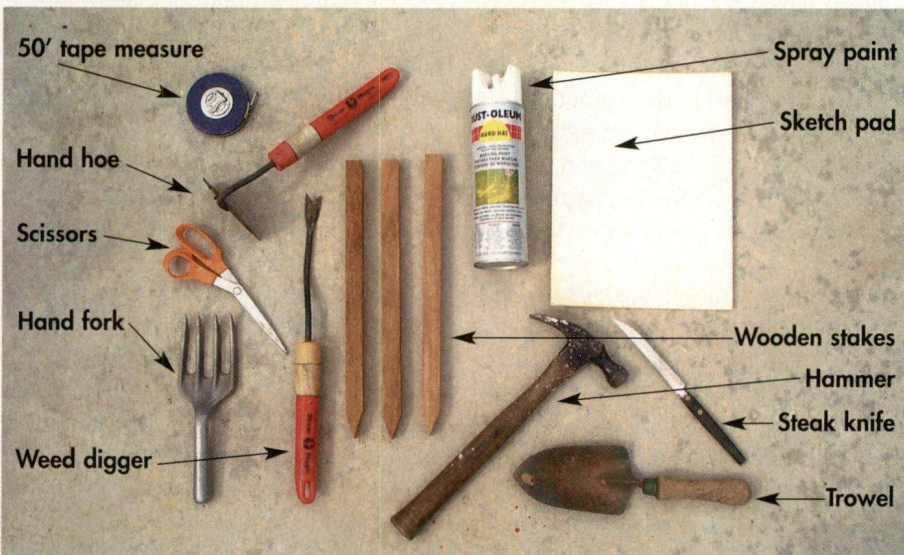
A **carpenter's hammer** is fine for regular construction tasks, such as building wood sub-roadbed or other structures.

A **five-pound sledge hammer** can be used for all the jobs that require "a bigger hammer." This tool will drive stakes into the ground, move rocks into position, and a number of other tasks that require brute force.

A **pry bar** will be useful when you are trying to position large rocks. Leverage is your friend.

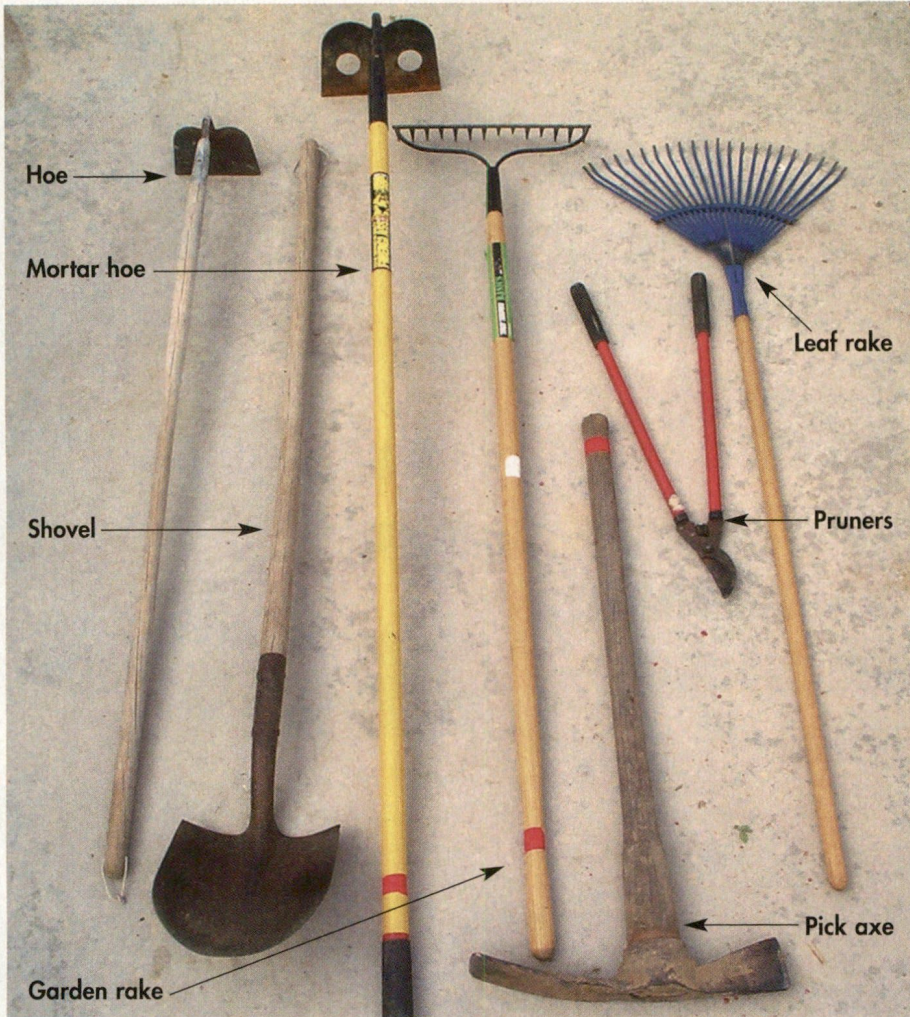
A **tamper** is used to compact the roadbed once you've finished pouring the stone. It's also good for compacting sand or fine stone as a base for flagstone or brick walkways. You can buy one or make one by screwing a thick piece of plywood to a large dowel.

A **two-wheel dolly** is a great way to move large rocks around the yard. The



They hold stuff, or you can turn them upside down and sit on them. Best of all, they're cheap. If you can't find them lying around, go to a local construction site and ask for a few. They're usually more than

happy to accommodate. If the workers are really nice, you may be able to leave with additional construction materials as well. Some contractors view rocks as a nuisance and will let you grab what you want.



advantage of this over a wheel barrow is that you don't have to lift the stone; instead, you just slide it on.

Artist's sketch pad. I use a sketch pad for any construction notes, sketches, and ideas I have for the railroad. It's nice to have everything in one book, so you don't have to save the bar napkin you sketched your water feature on the night before.

A **handsaw**, for cutting landscaping timbers, boards, and other items that need to become shorter to be useful.

A **power miter saw**, or chop saw, is an alternative to a handsaw, and generally much more accurate. It's also a lot easier on the arms. It may not have the capacity to cut thick timbers, though. A **chain saw** would come in handy there.

Tree saw. It's always best to get rid of pesky branches before they have a chance to fall on the track. A tree saw allows you to remove many of these branches. Most have both a saw for larger branches and

a pruner for the smaller branches.

Scissors, for cutting, of course. Don't use your best pair, though. Find an old pair that can be kept with the rest of the gardening tools.

A **steak knife** comes in handy for cutting, but they're also great for edging and weeding. Again, you'll want to find an old one that you can designate as the gardening knife.

There will probably be other tools that you will find handy during construction, but those listed above are many of the most common ones you will likely need access to. You may already have most of these on hand. If you're just starting out, though, don't go out and buy all the tools at once. Just get them as you need them and build up your collection slowly.

Next time, we'll take a look at track construction and some of the tools you will want to have on hand once you're ready to start putting rails down. **II**

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The right tools for the job, part 2

What do you do once all the earth has been moved and you're ready to start putting down track? The first step is to make sure you have the right tools to construct your garden railroad. Many of these will likely already be on your workbench. Some are a bit more obscure, but will quickly become necessary once you begin to lay track. Most of these tools you will want to have handy before you begin track laying, as they will all be instrumental in construction. Fortunately, you won't break the bank by purchasing most of these tools.

An **extension cord** is important to get electricity out to the garden where you need it. Get a good, heavy-gauge cord that will be robust enough to withstand almost any load you want to put on it. Get the longest one you can, as well. Backyards are longer than you think, so make sure you have enough to get to the far corners, if necessary. Remember, extension cords tend to snake through the garden as you use them.

Cordless drill. I'm a big fan of cordless tools in the garden. The fewer tools you have tethered to a power outlet, the better. Cords have a habit of getting snagged on any little object, especially freshly laid track. A cordless drill is perhaps one of the most useful tools you can have in your toolbox. You'll find that you begin to use it for almost everything. Don't skimp on this one. Get one that runs on at least 12 volts, more if it's available.

Screwdriver set (small and large)—don't build a garden railroad without one. You'll need not only the common, household sizes, but miniature screwdrivers as well. Get both flat and Phillips varieties. These are necessary for any maintenance on the equipment you will be running. It's also a good idea to get a set of screwdriver bits for your cordless drill. Some drill or screwdriver sets include these.

Drill bits. Get a good-quality set of standard drill bits ($\frac{1}{8}$ " down to $\frac{1}{16}$ "). These will serve most of your basic track-construction needs. If you intend to work with concrete, you'll probably want to get



Photos by Marc Horovitz

Having the right tool for the job will make building your garden railway much easier and more enjoyable. Some of the ones you'll need are shown in these pictures. 1. Weed sprayer; 2. Long extension cord; 3. Battery-powered Dremel tool; 4. Flashlight; 5. Cordless drill with screwdriver bit; 6. Cheap paint brush; 7. Drill bits; 8. Variety of sandpaper.

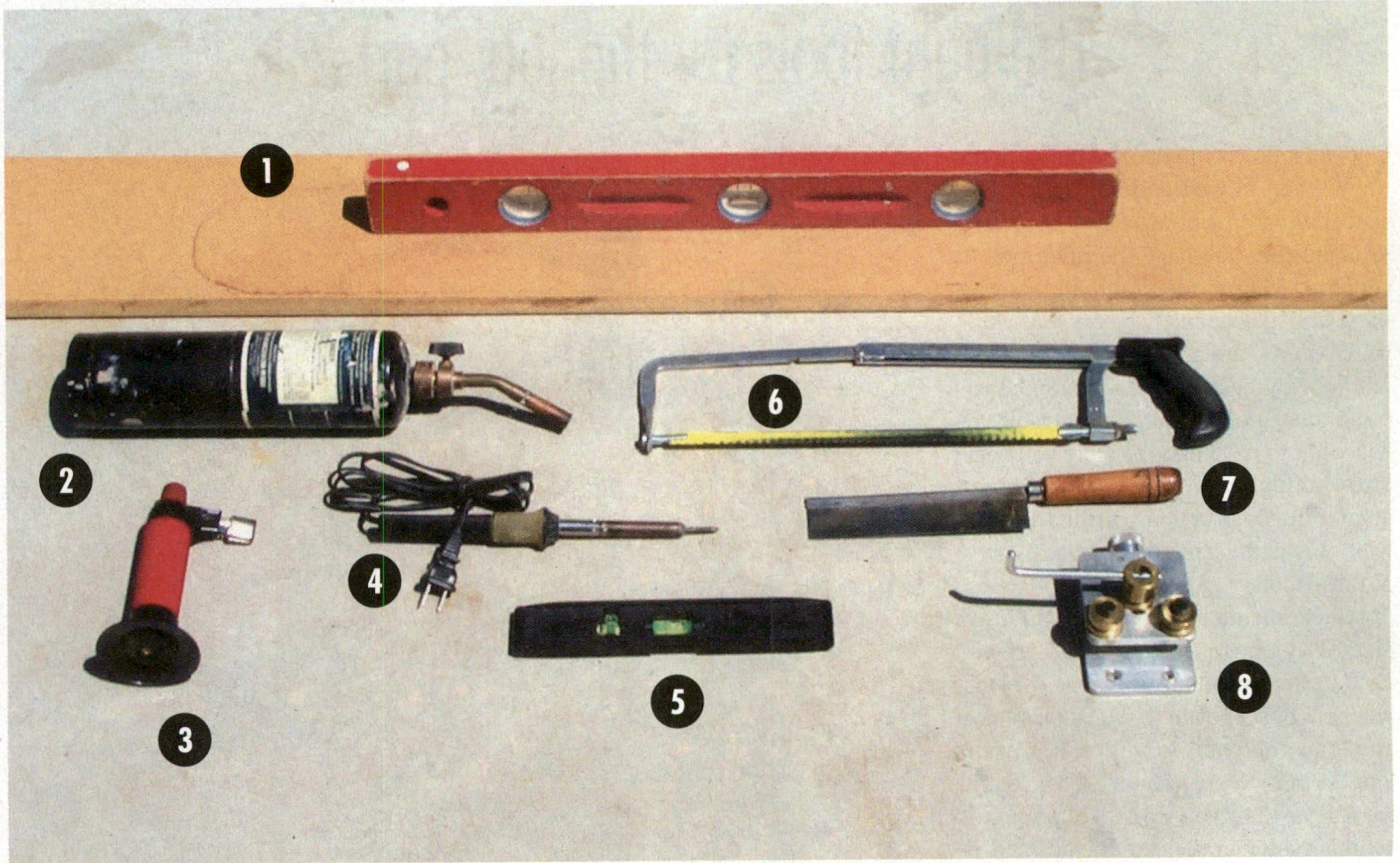
some masonry drills as well. Don't use one for the other, though. You'll destroy both the bits and the work.

A **Dremel or other small motor tool** is valuable for getting in places where a cordless drill will not fit. A variable-speed tool is best, but is not essential. High- and low-speed settings will likely be sufficient in most instances. These tools are very useful for grinding and cutting rail (and a thousand other model-railroad applications). There are cordless models of

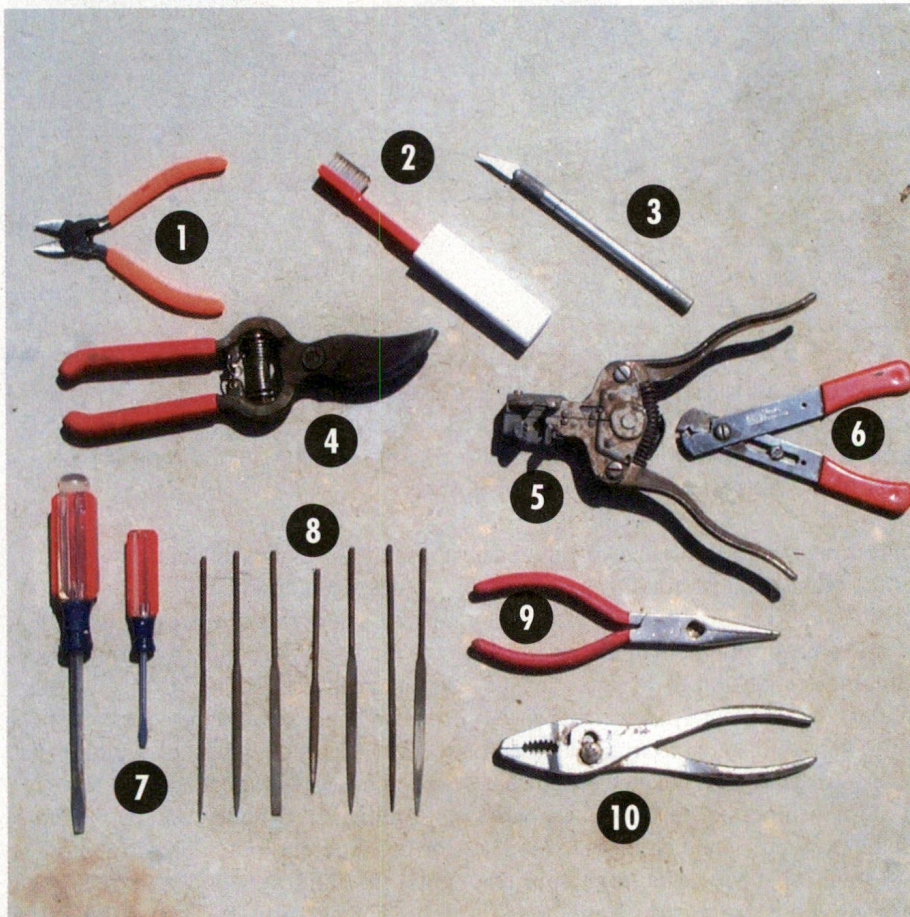
these motor tools available, as well.

Files (small and large). A good set of jeweler's or needle files are a necessity for smoothing any little bumps or rough spots in the trackwork. A large mill file will also come in handy for evening out rough spots in switches, solder joints, or anything that gets in the way of the flanges.

Sandpaper. Get a few different varieties for the different jobs. Coarse (60 grit) is good for sanding wood or other tough jobs. For cleaning track and polishing



ABOVE: 1. Level on a 4' board; 2. Propane torch; 3. Small butane torch; 4. Soldering iron for wiring; 5. Torpedo level; 6. Hacksaw; 7. Razor saw; 8. Rail-bender.



BELOW: 1. Wire cutters; 2. Old toothbrush; 3. X-acto knife with #11 blade; 4. Hand pruners; 5. Automatic wire strippers; 6. Simple wire strippers; 7. Screwdrivers; 8. Needle files; 9. Needle-nose pliers; 10. Regular pliers.

metal wheels, you'll want to use a fine sandpaper (300 grit or finer.) The finer the grit, the smoother the surface. You'll want as smooth of a surface as possible, as dirt will collect in any recesses, no matter how microscopic. A fine grade of **steel wool** works well for cleaning wheels, also. Don't use steel wool on track or locomotive drive wheels, though, as the steel fibers can get into the motor, causing electrical havoc.

A **soldering iron** is a necessity for making sound electrical connections between electrical components. These can be found in varying wattages, but for most of your electrical wiring needs, a simple 30-40-watt iron will suffice. The higher-wattage irons are good for soldering wires to the track,

but are much larger and will easily fry small electrical components.

A **soldering gun** is an alternative to a large soldering iron. Typically, these guns have two heat settings and can run up to 300 watts—usually enough power to solder wire to our heavy brass rail.

A **propane torch** is the heavy artillery of the soldering world. Use this when irons and guns aren't strong enough to work or when you have to heat large areas at the same time. Small, butane-powered torches are also useful.

Needlenose pliers are an all-around tool that should be one of the first things in your toolbox. Use them to hold things being soldered or worked on, to bend wires for attaching to screw terminals, and for other jobs too numerous to mention. A small and large set of these pliers will allow even more flexibility.

Wire cutters, as the name suggests, are used to cut wire. They are also good at cutting other things, such as plastic wire-ties and small twigs. Note: if you go to the hardware store, you are more likely to find what's commonly called "linemen's pliers." These are fine for wiring the addition on your house, but you'll want to get a smaller version for use in the garden (about 5" long). Radio Shack carries them, as do some hobby shops and craft stores.

Wire strippers are used to strip the insulation from around electrical wire, so you can connect the wire to whatever it needs connecting to. There are two types, simple and automatic. Both work equally well.

A **hobby knife**, such as the X-acto brand knife, is a sharp knife that you can use to cut almost anything imaginable (including fingers, so be careful). You can get different blades for different tasks, but the one commonly referred to as a #11 is the most universal.

A **razor saw** is a small, thin saw that allows you to make thin cuts in various materials. The most common use in the garden is for cutting rail, although a hacksaw may work a bit quicker for that. A razor saw is best used in situations where a hacksaw would otherwise be too big and bulky.

A **railbender** is probably the most specialized tool you'll need if you're handlaying your own track or using flex track. If

possible, see if you can borrow one from your local club or a nearby modeler. You may want to buy your own eventually, but borrowing one is a good way to get started.

A **4' level** (or a shorter level on a 4' board) is an essential tool for checking the grade of the track over a given distance. Four feet is a useful length, as it allows easy math for determining the grade. A half inch of rise is almost exactly equal to 1% of grade. (It's off by about .04%—not enough to worry about.)

A **torpedo level** is a short (about 9") level that is useful in checking if the track is level from side to side, so that your trains don't lean one way or the other.

A **flashlight** helps you see inside tunnels and other dark places. It will highlight dirt and other debris that hampers your train's progress.

A **drywall sander** is perhaps one of the most basic track-cleaning devices you can buy. You can put fine sandpaper or a Scotch-Brite pad on the end to polish the track. The pad is non-abrasive, so it polishes the rails without scratching the surface.

A **1" or 2" paintbrush** is great for spreading ballast, as well as giving buildings a quick dusting. The cheap variety will be more than adequate for this task.

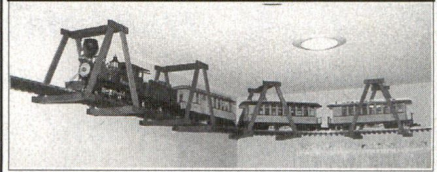
A **toothbrush** is a must for clearing dirt and ballast from the points and frogs of switches (turnouts). The good news is that you won't have to replace it every six months.

A good pair of **hand pruners** is essential for maintaining and shaping the plants in your garden. Clean cuts are important to maintain the plant's health and a sharp pruner's blade is the best way to accomplish that.

Weed sprayer. I use this more often for watering and cleaning than I do for weed control. It does a great job of setting ballast and an equally great job of cleaning splattered dirt off the sides of buildings before an open house.

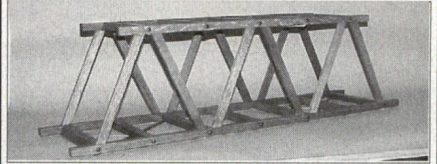
There are other tools and devices that folks have developed over the years for specific tasks that perhaps we will talk about in the future. This will get you started in your endeavor, though. Next time, we'll take a look at track—what's available and how to go about putting it down in the garden. **II**

Overhead Bridge Brackets



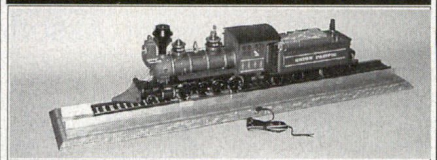
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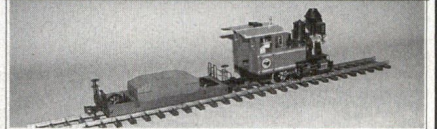
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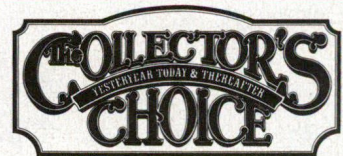


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