



Vol 51 Issue 4

The Rock River Valley Division, RRVD, is a local division of the Midwest Region of the National Model Railroad Association, NMRA. The RRVD serves NMRA members in areas of Green and Rock Counties of Wisconsin and Boone, Jo Davies, Lee, Ogle, Stephenson, Whiteside, Carol, DeKalb and Winnebago counties in Illinois. The RRVD holds monthly meets typically the first Sunday afternoon of each month, September through May, in Rockford at the Midway Museum Center. The meets start at 1:00 PM. The meets consist of various clinics on model railroading with a variety of model contests as well as door prizes for those in attendance. The RRVD will hold its annual Train Show and Sale March 30 and 31, 2019 at Belvidere North High School.

### **The dates for the 2018/2019 meet season are the following.**

September 9, 2018  
October 7, 2018  
November 4, 2018  
December 2, 2018  
January 6, 2019  
February 3, 2019  
March 10, 2019  
April 7, 2019  
May 5, 2019

### **Board Members**

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### **Committee Chairpersons**

Membership Chairman – Clarence Welte  
Monthly Event Contests Chairperson – Ken Marshall  
Layout Tour Chairperson – Burt Morris  
Clinics Chairperson – Ron Johnson  
Publicity Chairman – Joe Whinnery  
Trainfest Chairman – Ray Dyreson  
Annual Train Show & Sale Chairman – Doug Loy  
Membership Recruitment – Charlie Wickhorst

## **Committee Members**

Registrar – Don Brindle  
Electrician – Dick Caudle  
Publicity – Ray Dyreson  
Building Floor Layout – Tom McCabe  
Elections & Nominating Chairman– Gary Loiselle  
Midway Village Train Show Chairman– Tom Maladecki  
Midway Village Trick or Treat Event Chairman – Dick Caudle  
Christmas Layouts in Stores Chairman – James DeVoe  
Flimzie Editor – Ken Reinert  
Advancement Chair – Gary Loiselle

## **Members holding other division responsibilities**

RRVD Archivist – Don Brindle  
Audio / Visual Technician – Ken Marshall  
Company Store – James DeVoe  
Facebook – James DeVoe & Ken Marshall  
BOD Meeting Site Coordination – Charlie Wickhorst  
Auditor – Tom Maladecki  
Library – Gary Loiselle  
Website / Internet & Flimzie Mailing List – Mike Schmidt  
Photography and Publicity – Joe Whinnery

## **From the Superintendent by Bruce Giersch**

For those of you who have been busy in your basements working on your model trains, you may have not noticed that spring is here, and it is time to get outside. With this in mind, how about joining us on our June junket to Wandering Tree Estates on June 26<sup>th</sup> (Tuesday) to see some wonderful indoor and outdoor layouts. The cost is \$25. If you would like to go or have questions, please contact Bert Morris, Layout Tour Chair, at 815/520-1307 or e-mail at: winxxx1115@gmail.com. Last date for signing up is June 17<sup>th</sup>. We will be carpooling from the Cherryvale Mall

parking lot, meeting at the NE corner of the parking lot on the north side of Sears. We will be leaving at 8 am.

The Midwest Regional Convention was held in Madison last month and then the SCWD hosted our dual meet with them on May 6<sup>th</sup>, thus ending the 2017/2018 season. I hope that all of you had opportunities to attend many of the model railroading events held in this area.

At the last RRVD Board of Directors meeting we created a new committee to recruit membership. Clarence Welte chairs the Membership Committee, which tracks our current membership, non-members attending our events, and retention of members. This new committee will compliment these activities with focus on the recruitment of new members and those folks who dropped their NMRA membership. Charlie Wickhorst has volunteered to chair this committee and invites others to join him.

Coming up on Tuesday, June 26<sup>th</sup>, is our final event for this season, the junket to Wandering Tree Estates to see their fantastic outdoor and indoor layouts. The RRVD BoD has already been working on events for the 2018/2019 season. The decision for now is to continue to hold our monthly Meets at Midway Village. Our first Meet will be September 9<sup>th</sup>. On October 20<sup>th</sup> we will have the Division's "Rockford Route" on display at the Trick or Treat Event at Midway Village as well as handing out candy. This event is being chaired by Dick Caudle.

November is Model Railroading Month and we start to get really busy then, so we will be looking for members to help out in these events and support the hobby. On November 3<sup>rd</sup> we will have our Train Day at Midway Village. Tom Maladecki is the Chair for this program and will be looking for volunteers in the future to make this event successful.

On November 17<sup>th</sup> we will again be co-hosting the Police District 1 Train Fest. James DeVoe is chairing this event. Then at the end of November, or the beginning of December, we plan on supporting Nicholas Conservatory with their garden railway display during the holidays and into January. Here again we will have our "Rockford Route" on display

along with other materials promoting model railroading and the RRVD. James is also working again with Katie's Cup for a model train event there in early December.

On December 2<sup>nd</sup>, we will be having our annual garage sale at Midway Village.

Our 2019 annual Model Train Show & Sale tentatively will be held March 30 & 31<sup>st</sup> again at Belvidere North High School. Doug Loy will chair this event along with his committee members.

The 2019 Midwest Regional Convention will be held on May 15<sup>th</sup> thru 19<sup>th</sup> in La Crosse, Wisconsin.

And finally, the RRVD BoD has approved hosting the 2021 Midwest Regional Convention here in Rockford. That is only 2 years away and, in the meantime, we need someone to volunteer as Chair and then put together a committee to begin work on this program.

### **RRVD BoD to follow the NMRA's "three strike policy"**

At the May 16<sup>th</sup> RRVD Board of Directors meeting, the RRVD Board of Directors approved following the Visitor Policy which was adopted in 2007 and then reaffirmed by the NMRA Board in 2015. The needs of the NMRA insurance provider have played a large part in the adoption of this policy, but there are also issues of basic fairness, as well as tax issues.

Effective with our meetings starting in September 2018, we will begin implementing the NMRA's visitor policy. We will start with a clean slate, in that we will not take into consideration visitors that may have attended in the past. At each meeting, when a non-member / guest signs-in, he or she will be introduced to members of our membership & recruitment committees who will then explain what the NMRA is all about and answer any questions the guest may have. The guest will also be given a registration form at that time. If someone comes and tries us

out three times and still doesn't join, they will be informed that they can no longer come to a meeting until they do join the NMRA.

This policy does not apply to members' spouses or non-member caregivers. It does not apply to events that are organized for the general public, such as our Model Train Show & Sale, garage sale, District One Train Day, or the Train Day Event at Midway Village.

Guests can attend up to three meetings at no cost. There will no longer be a charge for guests/non-members. Guests will not be eligible to participate in our Division's contests or door prizes. They may bring items to show if they would like.

See you at our September Meet.

Bruce Giersch, Rock River Valley Division Superintendent

### **Upcoming Contest Schedule**

The following is a list of contests for the 2018/2019 season to give everyone a head-start to generate a contest winner. First prize includes a \$25 gift certificate to an area hobby shop.

**September:** Passenger Cars

**October:** Make a tree to see who can construct the best tree any scale.

**November:** A one square foot module containing a caboose used for a different purpose as suggested by Rich Mahaney April 2018 clinic.

**January:** Best painted figure. Bruce Giersch to supply figure for contest at the November Meet.

**February:** A model, car, building, module etc. which makes the best use of lighting.

**March:** A model or display with some part utilizing automation.

Example wind mill, sawmill, carnival ride or anything that moves. Use your imagination.

**April:** A one square foot module which will be displayed at the regional convention in La Crosse Wisconsin on May 15<sup>th</sup> thru 19<sup>th</sup>. The module must contain a piece of track which touches two sides of the module. Bruce Giersch will supply foam blocks in a few months preceding this contest to give ample time to complete the project.

**May:** A short video of your railroad or a friend's. Remember that this meet will include members from the Madison Division. This is a new type of contest which we never held before. There are members of our group who have some video experience. Ask Bruce Giersch or Ken Reinert and they will help to connect you with these individuals for technical advice.

## Upcoming Clinics

By Ron Johnson

**SHOW & TELL in September:** We are asking individuals to prepare a short presentation (just a verbal description is fine, too) about something model railroading or prototype railroading that you were involved in during the summer. Ten minutes or less so the SHOW & TELL can involve more people. By alerting everyone to our new approach to Show & Tell, it is our hope you keep this in mind during summer travels or activities related to prototype or model railroading. Everyone who presents a SHOW and TELL, will be included in a special drawing which stands alone from the normal door prize drawing. Three prizes will be handed out. If you have further questions, please contact Ron Johnson (rondjohn@earthlink.net).

In 2018 April, we had the fortunate opportunity to hear and see Rich Mahaney from Gobles, Michigan present two clinics.

I will get to his first clinic shortly. His second clinic was entitled "The Second Lives of Cabooses for Model Railroaders". This was a very interesting clinic about how cabooses are being used for purposes other than their first job for many years - at the end of a train carrying a railroad crew ready to move the train across the country. But Rich's interesting presentation illustrated a "Second Life for Cabooses." With dozens of images, he showed us a rich history of how cabooses have

landed in backyards, or as restaurants next to a river, museums, shops, storage facilities and many other uses. We saw cabooses from around the United States. Some of the images of cabooses tickled us with various colors, mismatches and sometimes strange locations. This was an outstanding clinic.

Rich also put forth a request to build a foot square model diorama displaying a caboose used in a second life. To this end RRVD has scheduled the November 2018 contest to build just such a model. Since our Train Show at Midway village falls the day before our November meet, we ask entrants to bring their dioramas to be exhibited at that show. We also intend to display these dioramas at the Nicholas Conservatory Christmas time exhibit.

I asked Rich Mahaney if he would bring us his new clinic, "How to Design, Build and Deliver Exciting and Interesting Model Railroad Clinics!" He was more than willing. Lucky for us! Rich told me that over the years he's presented brand new clinics and tested his presentation skills on us! We were his guinea pigs!

Rich started his clinic by asking our members what clinics they would like to see at our meets and had me list them on a large piece of paper. I obliged and here's the list:

- Rock Island Railroad
- Standard and narrow- gauge scales
- Building structures
- Scenery
- Rock Molds
- Historical aspects of railroads
- Switch yards
- Weathering

Of course, each one of these ideas for clinics can be expanded to include several clinics.

I also have a long list of most popular clinic ideas from a division survey conducted in the fall of 2017.

There are lots of clinic ideas for next year. We especially want a good clinic in May 2019 because we will host the Madison division.

During the last model railroad year, one of the most popular meets was the one when we had four different clinics and people rotated through each clinic - "round-robin". We will do this again this coming year. The advantage of this method is that each clinic has a smaller group of people leaving a lot more room for discussion and getting "up close and personal".

Rich Mahaney also told us, instructed us, about how we all can be a clinician. Expect a call from me requesting your expertise and asking you to do a clinic. Perhaps, you will be willing if I ask you to be a clinician when we organize a "round-robin". You won't have to be in front of the large group, but in a smaller group.

### **Facebook and You Tube** **By Ken Marshall & James DeVoe**

Facebook, Twitter and YouTube accounts for the RRVD have been set up.

The Twitter and Facebook accounts are intended to help us reach new audiences, drive more traffic to our website, bring more people to our events and ultimately bring more people into the hobby and members to the NMRA. To date our Facebook account has shown 201 likes and 205 follows for this year. The survey taken at our March 2018 Show and Sale at Belvidere North High School revealed that 78 individuals learned about the show on Facebook.

The YouTube account will allow us to create and share videos of member layouts, member interviews, RRVD events, etc. with anyone searching for model train videos. This is yet another method of drawing interest to our hobby and the RRVD.

You can get to these accounts by going to our Web page and clicking on their icons. If you are a member of Facebook or Twitter you can go directly to the Rock River Valley Division NMRA to view the latest posting.

We are always looking for members who want to have videos posted of their layout. Contact James DeVoe or Ken Marshall.

### **NMRA Membership Benefits**

Just a reminder the RRVD has added a benefit for NMRA members allowing them to place a small advertisement in the electronic edition of the "Flimzie."

A current NMRA member or family member of a deceased NMRA member can place a 20 - word advertisement in the "Flimzie" to sell or trade model railroad items or railroad artifacts. Non-railroad items cannot be advertised; for example, household appliances or furniture. The advertisement should contain a telephone number and/or e-mail address which will not be counted towards the 20 - word limit. The individual placing the advertisement must contact the "Flimzie" editor by e-mail to place the advertisement. The current editor is Ken Reinert at [sewtrain@foxvalley.net](mailto:sewtrain@foxvalley.net). The advertisement will run for one issue. There are four issues of the "Flimzie" per year. Additional advertisements will require the "Flimzie" editor to be contacted each time an advertisement is to be placed.

The advertisements will be placed in the "Flimzie" under the heading **"SALE OR SWAP."**

A second benefit is a Discount Program at local hobby shops who are supporting the NMRA 10% discount program to all members on any item not already on sale. To take part in the program, bring your NMRA membership card to the store when you make your purchases.

Hobby Town USA see John  
5782 N. Alpine  
Rockford, Illinois 61114

Midwest Rail Junction see Scott  
1676 Alpine  
High Crest Shopping Center  
Rockford, Illinois 61107

## 2018 Show & Sale

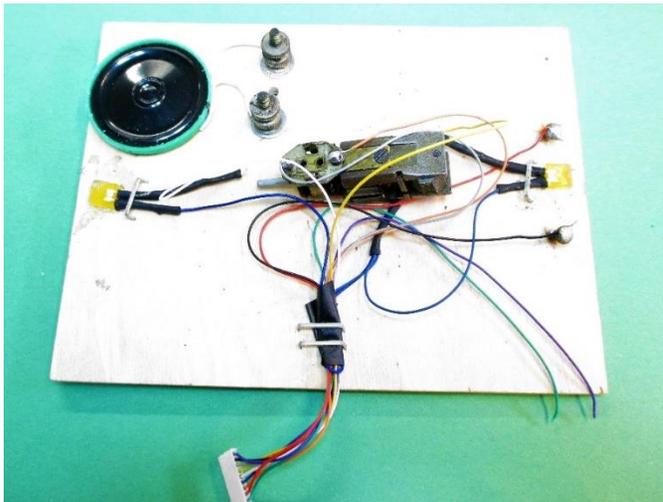
By Doug Loy

The 2018 Show & Sale has come and gone. The show was very well received for moving to Belvidere North High School. The layout of the vendors, displays and layouts was well received. This is mainly due to Don Brindles' expertise and experience after all these years on making the layouts for the show and sale. It is hoped that the Belvidere Community School District #200 will let us come back in 2019. The test track was used a number of times this year. There was a glitch that a bigger transformer for 3-rail testing is needed. If anyone would like to donate a higher watt transformer for 3-rail please bring it to a meet. The food served was very well liked as well as the service. It surprised us that the food service was delivering food right to the vendors, displays and layouts. This has never been done before and was very well appreciated.

## DCC Decoder Test Fixture

By Ken Reinert

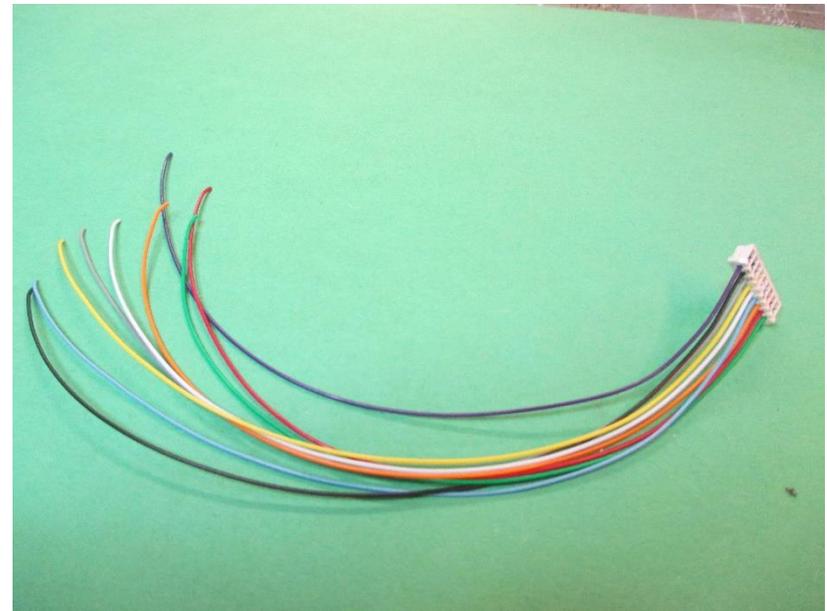
The following is an article giving more detail on how I built a DCC decoder test fixture. I originally presented this as part of a clinic titled "Tricks I Learned while Model Railroading." The picture below shows an overall view of the test fixture.



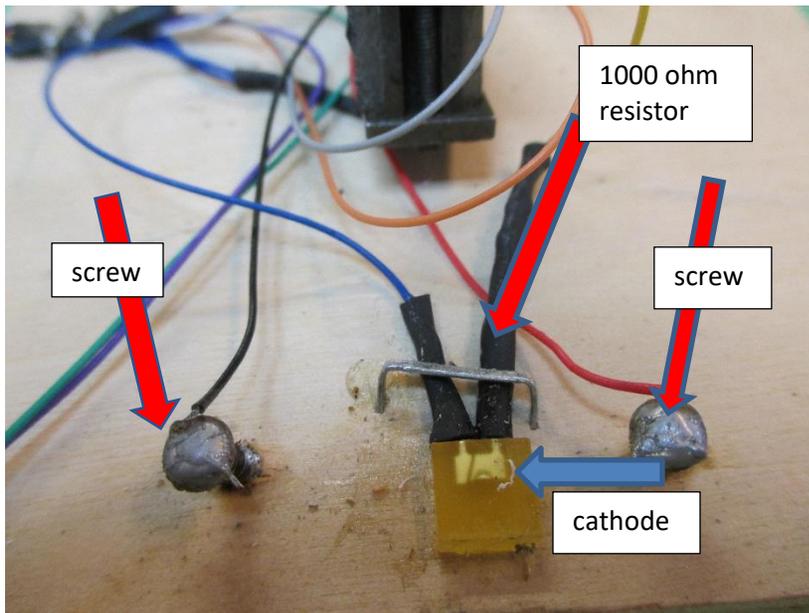
The fixture is composed of a scrap piece of plywood on to which various components are mounted. The project utilizes a DC motor (old Tyco motor in this case any DC motor will do), two LEDs, two 1000-ohm resistors, heat shrink tubing, DCC 9 pin female hookup cable, two round head wood screws, one 8-ohm speaker from a talking greeting card, two #6-32 screws, two #6-32 nuts, two #6 washers and four #6-32 thumb nuts.

The project starts by securing the motor to the middle of the plywood board. In this case a screw was positioned from the underneath side of the board to the motor mounting bracket. Depending on your motor type you may have to be innovative in your mounting method. The main thing is to secure it to the board, since the motor is free running it will not experience little if any torque.

The main hookup cable used was a nine-wire female connector which is used by the decoders I use. If your decoders use a different pin configuration, you want to use that cable type. Shown below is the 9-pin cable used.



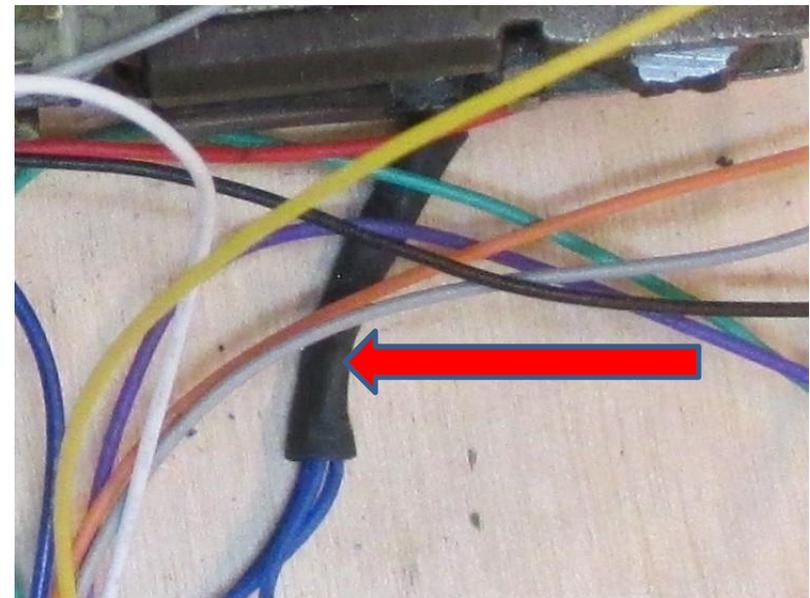
The next step was to secure two short round head screws to the test board. Their purpose is to be used for the attachment of alligator clips supplying DCC power to the fixture. In my case I simply clip the alligator clips to my program track to supply power.



Following placement of the screws to the board, I took two LEDs and solder a 1000-ohm resistor to the cathode lead of each LED. This is the lead with the larger flag as pointed out by the blue arrow. Use of a heat sink during soldering to LEDs is recommended to prevent heat damage to the LED. I use a clamping tweezers. The assembly will be covered with heat shrink tubing later when the wires are solder to the LEDs.

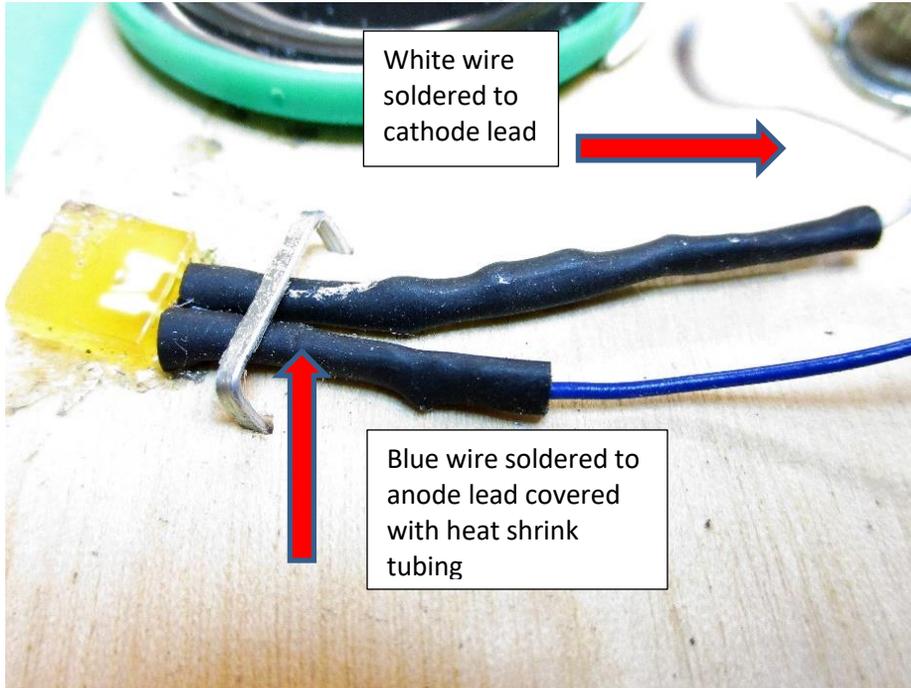
Now comes the time when the cable assembly wires are to be soldered to their proper termination points. It is important that the color code as stated in the text be followed or the tester will not work or even cause damage to the decoder board you are testing.

The first task is to create a wye connection with the blue wire of the cable assembly. This is the common + or ground for the front and rear headlights. The wye joint is then covered with heat shrink tubing by sliding the tubing over the solder joint and heating it with a soldering iron tip to shrink it.

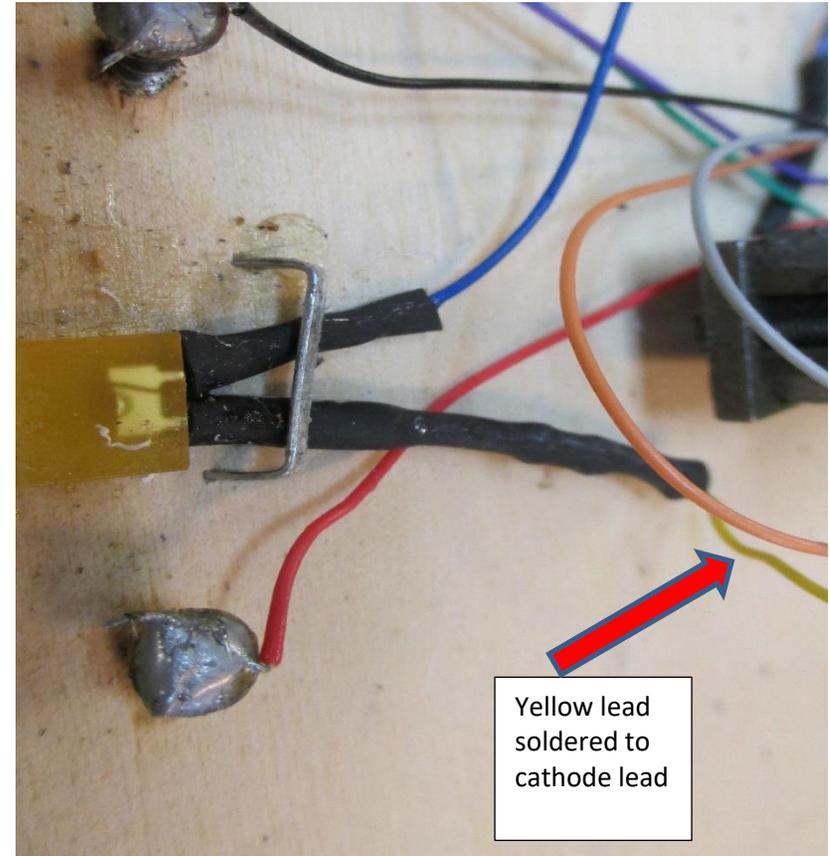


Following the construction of the blue wire wye, the next step is to solder one end of the blue wire wye to an anode lead (the LED lead without the resistor) of each LED. Make sure that the heat shrink tubing is positioned and slid down the wire before soldering the wire to the LED. After soldering the wire, slide the heat shrink back over the joint and apply heat to shrink the tubing.

### Front Headlight



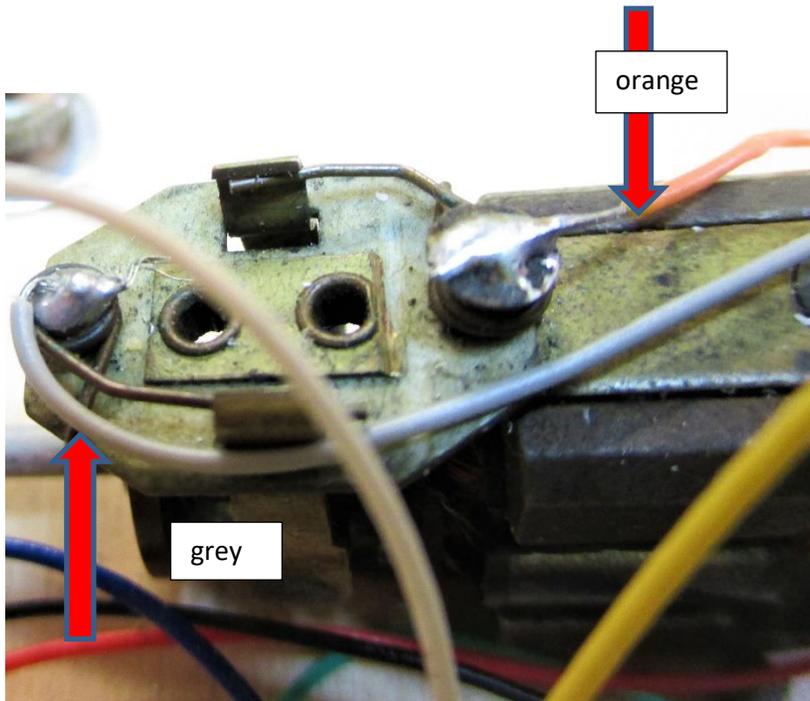
### Rear Head Light



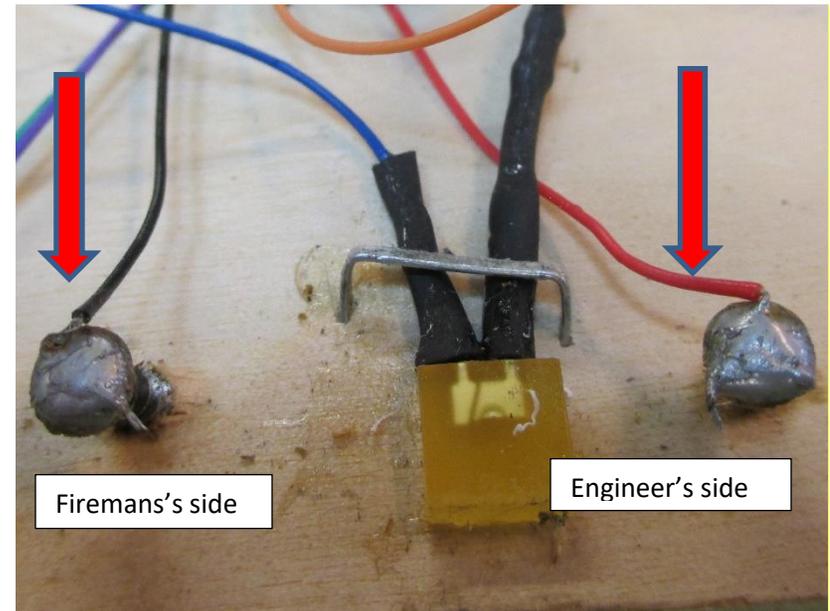
Determine which LED you want to be the front headlight. Now take the white wire cable lead and solder it to the cathode side of the LED (side with the resistor soldered to it). Make sure to position heat shrink tubing to the wire first and slide down the wire. Solder the lead to the LED. Slide the heat shrink over the solder joint and resistor. Heat to shrink tubing.

The remaining LED will now be considered as the rear head light. Take the yellow lead from the cable assembly and solder it to the cathode of the rear LED using the same procedure as used for the forward light.

Following the connection of the LED leads, I then soldered the two motor hookup wires to the motor brush terminals. In my case I soldered the grey wire from the cable assembly to one motor brush terminal and the orange lead to the other brush terminal. If you are using a newer style motor, then solder the grey lead to the negative marked terminal and the orange lead to the plus marked terminal. Polarity is not critical since when testing the decoder, you mainly want to see if the motor's rotation changes direction as you press your forward or reverse button on your controller.



The last two wires to be connected for the style of decoder that I am testing are the red and black power supply wires. The black wire gets soldered to one of the screw terminals (designated as the left side or fireman's side of the locomotive). The red wire gets soldered to the other screw terminal (designated as the right side or the engineer's side of the locomotive). Again, the orientation is not critical if you are only testing the decoder's functions. However, if you are aware of the motor's rotation direction for forward and backward in the locomotive in which the decoder will be placed, connecting the track power to the test fixture will tell you if forward and backward direction is properly programmed for your locomotive. You can reprogram the decoder while it is in the test fixture as it is hooked up to your program track.



Screw terminals to which alligator clamps from program track can be connected.

It should be noted that there is a green wire and violet wire from the cable assembly which are not used in my application. If the decoder you are using utilizes these leads for other lighting functions, they can be hooked up to two additional LEDs along with resistors and a branch connection to the blue common wire which will enable you to test those decoder functions. After all the solder connections had been made, I secured the wires to the plywood base with hold-down staples. Since I gave my original clinic, I included a speaker to enable testing of sound decoders. The speaker used came from a sound activated greeting card I received for my birthday. The speaker is eight ohms required by most sound decoders. I simply secured it to the plywood base with double sided foam tape. The speaker leads are connected to two #6-32 bolts positioned through the bottom of the board then a washer was placed over the bolts. The speaker leads were positioned between the washer and a thumb nut tightened to hold them in place. A second thumb nut was placed on each bolt which enables one to place the speaker leads from a sound decoder between the lower thumb nut and top nut to make the connection.



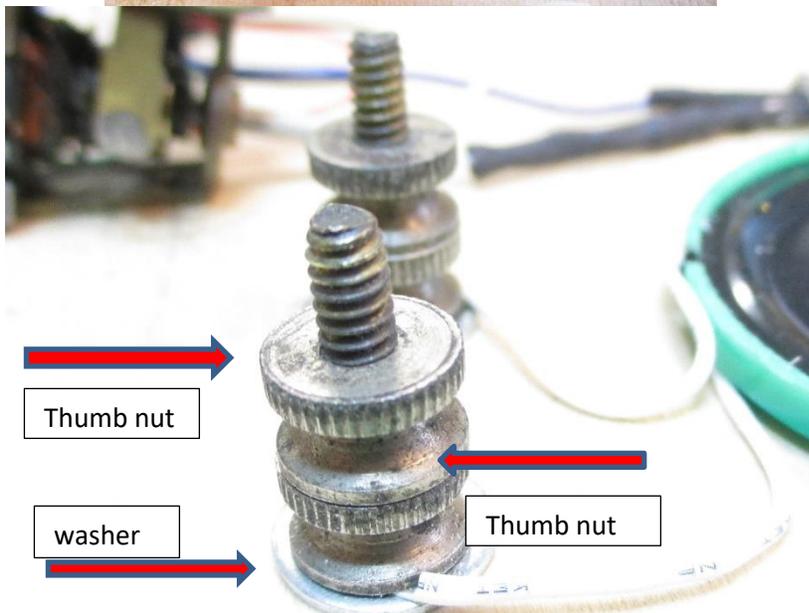
use the tester mostly to determine if a decoder works properly if it did not work in a locomotive. The tester allows me to pinpoint if the problem lies with the decoder or with the locomotive.

Happy Testing!

## Assembling Kadee Coupler Springs Without Losing Them By Ken Reinert

When I presented the “Tricks I Learned While Model Railroading” we had some difficulty with getting clear pictures using our new computer with our old projector. [since taken care of] Therefore, I have included clearer pictures of the process.

The aim of my procedure is to keep the knuckle spring from popping off your insertion tool and flying off to some unknown location. These springs are small and almost impossible to find. Shown below is a picture me crawling around the train room floor with a magnifying glass and tweezers trying to locate a missing spring. Not a pleasant or rarely productive task.



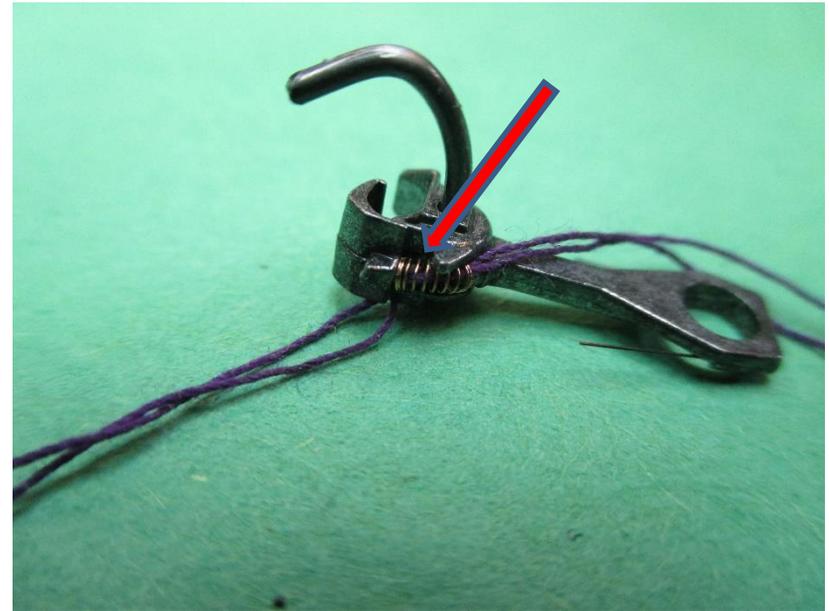
To test a decoder, I connect double ended alligator test leads from each track of my program track to the corresponding power terminal screw post on the test fixture. I then plug my decoder to be tested to the nine-pin female socket of the tester. If the decoder comes directly from the manufacturer, it can be addressed as #3. I prefer to change its address to the locomotive to which it is going to be installed. The speaker leads from sound decoders can also be hooked up and tested as well. I find I



I found a solution to the problem of flying springs 40 or so years ago in an article in "Railroad Model Craftsman." It involves borrowing some thread and needle from your wife's sewing supplies. If your wife does not sew simply buy a needle and thread of your own. First thread the needle with about 16 inches of thread. I then position the threaded needle through the spring directly as it leaves the Kadee package. Once the needle point is positioned through the spring I slide the spring down the needle and halfway down the thread. The thread captures the spring, so it will not fly away and forever disappear into the great unknown.



The next step is to position the spring to the coupler while still captured by the thread to the non-movable spring mounting post of the coupler. I usually utilize a small jeweler's screw driver or Kadee spring holder/un-coupler tool for this. After the spring is positioned to the non-movable post, it is simple to position the 2<sup>nd</sup> end to the movable post of the knuckle.



The above photo shows the spring positioned to each mounting post of the coupler. Note that the thread remains positioned through the spring. If spring wants to fly off the mounting post during assembly it will not go anywhere. After you are sure the spring is properly mounted, gently pull the thread through and out of the spring and coupler. I have never lost a spring using this method and have used this same needle and thread for over forty years. My wife has never asked me to return the needle. Maybe she does not know I even have it after all these years.

# Cornu Spiral Easements for Model Railroading

By Ken Mosny

Railroads recognized early on that some sort of transition curve is needed between straight trackage and curved trackage. A straight leading directly into a radius causes violent lurching leading to passenger discomfort and derailments as well as damage to equipment, lading and trackage. We have all seen this sudden change of curvature on model tinplate and prefabricated “scale” trackage. Various transition curves were tried, but by the late 1800’s the Cornu spiral predominated. This spiral is also called the cubic spiral because a practical mathematical first order equation approximation of it is a simple cubic equation.

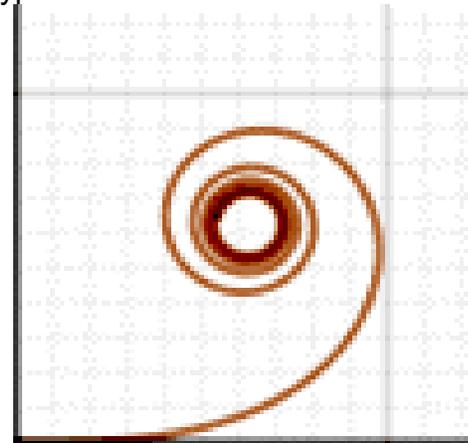
The forces needed to push railcars into a curve are very large amounting to tons per car even at speeds of 30mph. The physics of the Cornu spiral provides a steady increase of this force from zero at the straight trackage to what is needed at the radius trackage. This eliminates lurching. Superelevation, the raising of the outer rail on a curve, tilts the railcars inward at the radius to use the leaning weight of the car to provide a force to turn the car. The steadily increasing turn of the Cornu spiral provides a distance along which the outer rail is gradually raised or “superelevated.”

Model railroaders, of course, do not need the physics of an easement to prevent damage to equipment or discomfort to passengers. We do it mostly for appearance and the operational benefits in preventing wild side to side coupler swings as cars enter and leave curves. We also have a much larger proportion of curve to tangent trackage so smooth flowing curves are important to us.

Over the years, probably the most described method I have encountered to make easements is the “bent stick easement.” A tangent and radius are laid out, and then, a thin flexible wood or metal slat, i.e. “bent stick”, is bent and traced along to smoothly join the two. This is at best a hit and miss eyeball procedure with no guarantee of good results. Flex track does, to some extent, automatically provide the bent stick if it is allowed to find its own path between the tangent and radius, but, again, it is not a scientific but eyeball procedure. Furthermore, bent stick method, if done properly, is not easy because the stick must be forced into position and somehow held in place each time while the path is traced.

A template provides a much easier and more procedural method. The straight and the radius are laid out in precise relation to each other according to a tabulation, then the easement template is traced to join the two. No guesswork. If the geometry doesn't fit the space, it doesn't fit, period, so don't fudge it. Do something to get more space or less trackage. You can get good results consistently.

The same Cornu easement the prototype uses will get us good results. Here is a picture of a Cornu spiral the prototype uses.



The curve starts out tangent to the horizontal and with

a constantly decreasing radius as it spirals to a point. The part of the curve that we are interested in is only from the horizontal sloping upward to where it is first vertical. Since the Cornu spiral has the property of a known constantly changing radius we can use it to smoothly join a straight to a radius as follows:

Start the Cornu easement at the straight horizontal and stop the spiral at the desired radius. Then, start the desired radius of your curve tangent to the spiral there. If you have a template of the Cornu spiral curve, this is very easy to do. This article describes how to construct the template with the proper tangent to radius relationship. Note that we use much smaller radii on our model railroads than the prototype, so we need to follow the spiral further up the slope to vertical where the radius is smaller. The prototype never goes farther up than about 15 degrees from the horizontal and model railroads will go up to 45 degrees or more. To a slope of 15 degrees, the Cornu spiral and its first order approximation, the cubic spiral, are for practical purposes the same curve. The prototype calls this curve "AREA 10 chord cubic spiral."

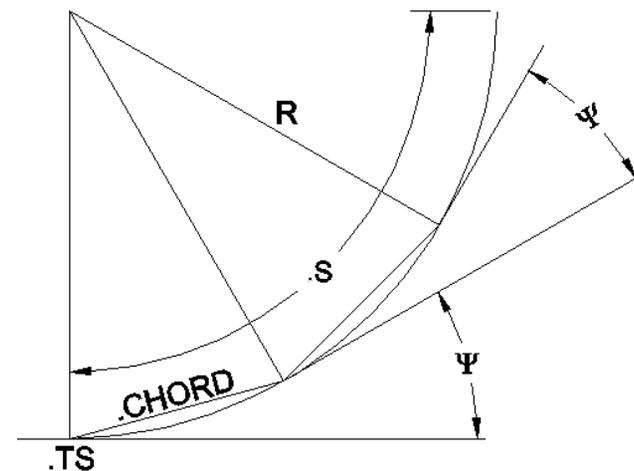
First, a little background. There are several books and articles in the hobby press that apply transition spirals to model railroading. The best I have found include:

1. "Laying Out an Easement with Model Railroader Templates" by Bruce Bardes, David Stackhouse and Linn Wescott, Model Railroader, October, 1969, pg. 60
2. "Transition Curves" by John Lukesh, NMRA Bulletin, December 1980, pg.20
3. "Trackwork Handbook" by Paul Mallory, Boynton & Assoc., out of print but commonly available used
4. "Design Handbook of Model Railroads" by Paul Mallory, Carstens Publications, out of print but commonly available used

Of these, the Lukesh Bulletin article actually uses the Cornu spiral, the Model Railroader article appears to use the

Cornu spiral while Mallory uses the Cornu first order approximation cubic spiral. Remember that the cubic spiral is only accurate to an angle of about 15 degrees before more terms must be calculated. None of these publications mention that. Mallory was an early advocate of using templates to lay out easements.

Now for some math. You can skip this part if you want, but I am including it for those who are interested because it explains why the Cornu spiral works the way it does. To introduce the mathematical concepts behind a Cornu spiral, look at a familiar simple geometric shape, the circular arc. Geometrically, this diagram shows that such an arc can be defined with a center point, a tangent start point TS, a radius R, and length along the arc S. Given this information. The arc can be drawn with a string and pencil as when laying out the curves on a model railroad.



There is another way to lay out this arc, too. A railroad surveyor uses this method because locating the center is not practical and the radius can be hundreds or thousands of feet long. Start at TS and establish an angle  $\psi$  with a transit. Measure a distance at that angle from TS, say 100 feet, and mark with a stake. This 100-foot distance is a chord of the

arc. Go to the stake with the transit, measure the same angle and mark another 100 feet. Repeat until the curve length  $\underline{S}$  is finished. There is now a series of stakes 100 feet apart which mark the arc. Note that this survey method is a fundamentally different way of laying out a circular arc. The arc is defined as a change of direction along a distance. This change of direction as the arc is traveled is called the curvature, symbol  $d\theta/dS$ , by mathematicians. The formula for a constant radius arc is:

$$d\theta/dS=1/R$$

This formula says that the curvature of a circular arc does not change but is constant at the value of  $1/R$ . Now if the radius is very large, say 1000 inches on a model railroad, the curvature is very small,  $1/1000=0.001$ . The curvature of a 30-inch radius is  $1/30=0.0333$ . Thus, a small curvature creates a large radius and vice versa. In fact, the curvature of a straight line is "0" whereas the radius is "infinite".

An easement matches the curvature of a straight-line tangent,  $d\theta/dS=0$  to that of a circular arc,  $d\theta/dS=1/R$ , in a smooth and controlled way. Mathematically the formula used to do this is (the symbol \* denotes "times" or "multiplied by"):

$$d\theta/dS=k*S$$

This curve does not have a constant curvature. As we travel along the spiral, distance along the spiral,  $S$ , increases, the curvature increases and the radius gets smaller. This curve, called the Cornu spiral, starts at a straight line ( $S=0$ ,  $d\theta/dS=0$ ) and can be ended at any chosen radius.

Eventually, it curls to a point. " $k$ " is a number chosen to scale the spiral to a desired overall size.

Using mathematical calculus, a new formula can be derived by integration:

$$\psi=1/2*k*S^2$$

This formula is more intuitive because it is more geometrical. It computes the actual angle of the spiral instead of the rate of change of the angle from the tangent track as the train travels along the curve. Note that the angle is computed in a unit called radians. To convert radians to degrees, multiply

by 57.296. That is, 1 radian=57.296 degrees.

This is a very useful formula for surveying the spiral because it can be directly used as is. The surveyor can use this formula to compute the changing angle of the spiral. Using the transit to sight the increasing angles and a chain or tape to measure distances, the surveyor works his way around the curve in straight sections called chords. When he reaches the constant radius part of the curve, the angle change, usually per 100 feet, remains constant and the surveyor has generated the required easement.

It is easier for us to use a template to draw a model easement. To do this, we need  $x$  and  $y$  coordinates to plot points on a graph. Now, to get the formulae we can actually use to plot the graph needs a lot more math. There are no exact formulae for it, just an approximation. You may recognize from high school algebra that these formulae are called polynomials which are a string of terms added or subtracted to get a result. These Cornu spiral polynomials have an infinite number of terms with each succeeding term getting numerically smaller approaching zero. Here are the first five terms for  $\underline{x}$  and  $\underline{y}$ .

$$x = S - \frac{(k^2*S^5)}{40} + \frac{(k^4*S^9)}{3456} + \frac{(k^6*S^{13})}{322560} + \frac{(k^8*S^{17})}{1754722640}$$

term 1    term 2                    term 3                    term 4                    term 5

$$y = \frac{(k*S^3)}{6} - \frac{(k^3*S^7)}{336} + \frac{(k^5*S^{11})}{42240} + \frac{(k^7*S^{15})}{10321920} + \frac{(k^9*S^{19})}{3530096640}$$

term 1                    term 2                    term 3                    term 4                    term 5

As the end angle of the spiral increases, more and more terms must be computed to be accurate. Computing the first five terms is sufficient for our purposes, since this will result in a curve mathematically more accurate than can be drawn. If the angle  $\underline{\psi}$  does not exceed 15 degrees, only the first term of each formula is sufficient. The surveyor laying out a prototype spiral in the field cannot survey more accurately than that. Since for most prototype railroad use,  $\underline{\psi}$  is typically less than 15 degrees, the calculation of just the first terms work fine. This is called AREA 10 chord cubic spiral because the first term of the  $y$  equation contains  $\underline{S}^3$  (" $\underline{S}$

cubed”). Use by model railroaders is typically in the range of  $\psi$  up to 45 degrees because we have sharp curves by prototype standards.

All the tables presented here are computed to five terms for use to the practical limit of 90 degrees. In order to simplify the concepts, all the calculations will be described for HO scale in inches.

To do the calculations,  $\underline{S}$  is chosen as some small distance, so the points plotted for the spiral will be close enough together to make a smooth curve. About 0.50” for HO is good. Now, the big question remaining is, what value do we choose for  $\underline{k}$ ? As mentioned before,  $\underline{k}$  is a number chosen to scale the spiral to a desired size. In essence, it determines how fast the radius of the spiral will decrease, that is the “sharpness” of the easement. If  $k$  is too large, the swinging of the ends of the cars as they enter the easement will be severe resulting in bad appearance and possibly operational problems. Too small and the easement will be overly long wasting space.

John Lukesh in his article determined that the way to choose  $\underline{k}$  is to use the desired swing or lateral mismatch to determine it. A property of the Cornu spiral on a model railroad is that the lateral mismatch of car end sills and coupler swing is essentially constant over the length of the spiral even as the angle between the cars increases. This is because the rate of change of the curvature is constant for the Cornu spiral. Lukesh chose a maximum misalignment of 0.075” for HO based on Kaydee coupler gathering range. For a properly constructed Cornu easement, the ends of the cars will misalign this amount as they enter the easement and then remain so until exiting the easement at the other end of the curve. In other words, they will not sway side to side after entering the curve.

From Lukesh, the formula to determine  $k$  for a given desired mismatch is:

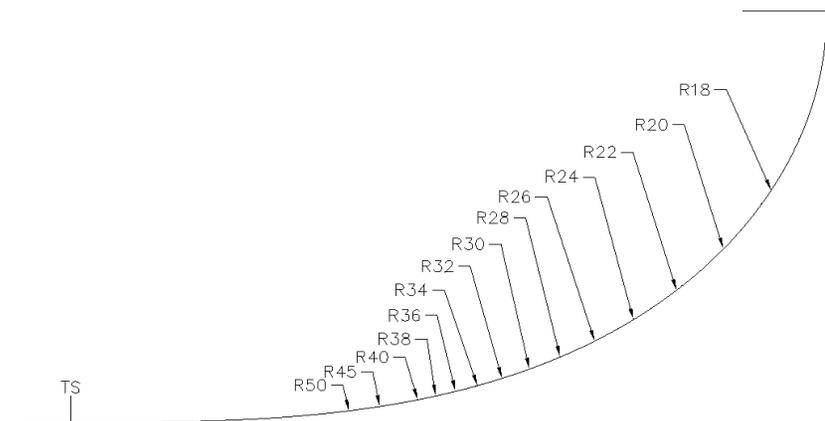
$$k = M \cdot 6 / [(2 \cdot b^2 \cdot a + 3 \cdot b \cdot a^2 + a^3) \cdot 4]$$

where  $\underline{M}$  is the desired lateral mismatch for HO which he and I take as 0.075”,  $\underline{a}$  is the coupler center to truck center distance, and  $\underline{b}$  is the truck to car center distance for the length of cars to be operated. Units are inches and the formula has been altered from

his original to redefine  $\underline{k}$  to be numerically the same as mine. Typical values for  $\underline{k}$  in HO are:

|                        |                        |
|------------------------|------------------------|
| 40 ft cars, $k=0.0076$ | 50 ft cars, $k=0.0053$ |
| 60 ft cars, $k=0.0015$ | 80 ft cars, $k=0.0012$ |

I take the value of  $\underline{k}$  as 0.001543. This is a good overall compromise keeping the easements a reasonable length. If you operate prototypically close coupled 80 ft cars with full working diaphragms, you may want a smaller value of  $\underline{k}$  to keep the swing less, but you will need to experiment. The 80 ft cars most of us have will operate fine with a value of  $k=0.001543$ . My prototypically close coupled 60 ft cars operate well with  $k=0.001543$ . If you read the Lukesh article, this easement is about midway between his size number 6 and number 8.



Above is a plot of the x-y polynomials. To create the plot, the x-y polynomials were computed for 100 evenly spaced points starting at  $s=0.45125$ ,  $s=0.90250$ ,  $s=1.35375$  and so on generating a table of 100 points. Fortunately, excel makes this very easy to do. At each point on the easement plot, the curve has a known radius. It starts as a horizontal straight line and ends at a radius of 14.36” where it is vertical. To use it, start at the lower left point  $\underline{TS}$  where the

straight joins, continue along the curve until the point of the desired radius, and start that radius tangent to the curve. Everything will flow smoothly together. I drew the curve in autocad, plotted it full size with an engineering plotter, and spray glued it to a sheet of left over kitchen project counter laminate. I then carefully cut and sanded to the line creating a durable template. If I were to make it again, I would use a 0.040' or 0.060' styrene sheet which is about \$20.00 for a 4'x8' sheet and easier to work. If you are in HO, I will have the template at the September meet and you can trace a copy. If you want the AutoCAD .dwg file, email me at [uiop999@comcast.net](mailto:uiop999@comcast.net), and I will send it.

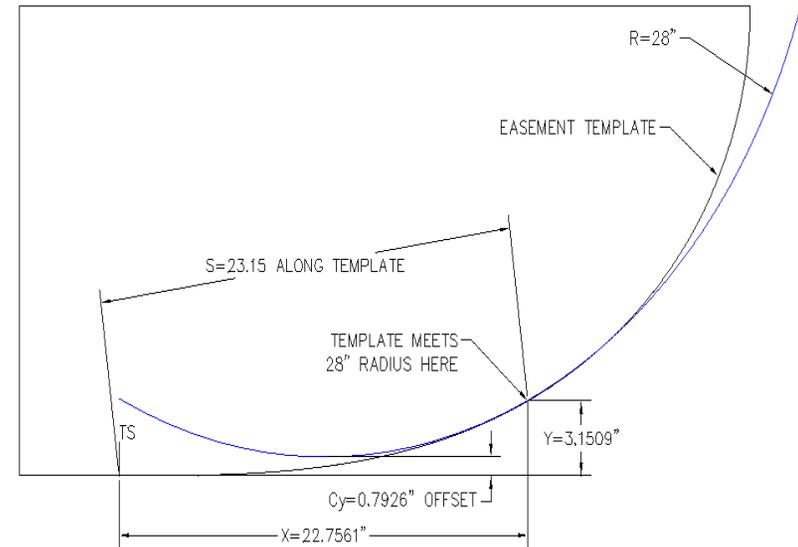
In order to use a template to draw a spiral, the radius must be offset vertically some amount from the straight track. Since the previous formulae calculate the angle and radius of the spiral at any point, simple trigonometry will find this offset. The formula for the vertical offset  $C_y$  of the center for the desired radius  $R$  is:

$$C_y = Y - R * (1 - \cos \theta)$$

The Spiral values  $R$ ,  $S$ ,  $X$ ,  $Y$ ,  $C_x$ ,  $C_y$  and  $\theta$ , of my standard spiral ( $k=0.001543$ ) are tabulated in the chart. For example, to lay out an easement for a 28" radius:

1. Read down the "R" column of the chart to 28.00 and find that the  $C_y$  offset for the 28.00" radius is 0.7926", about 51/64
2. Locate the 28.00" radius as desired, but instead of drawing it tangent to the straight track, shift the center 0.7926" (51/64") upward.
3. Align the straight edge of the easement template on the tangent track line and slide it to meet the 28.00" radius line. Verify that the template meets the radius at the distance "S", 23.15" (about 23-9/64") along the template from the point "TS". My template is marked at common radii to aid in determining the tangent point.

Trace the easement line along the edge of the template. The spiral easement and the radius should blend smoothly.



| S     | R      | X       | Y       | Cx      | Cy     | □       |
|-------|--------|---------|---------|---------|--------|---------|
| 3.24  | 200.00 | 3.2408  | 0.0088  | 1.6204  | 0.0022 | 0.4642  |
| 6.48  | 100.00 | 6.4809  | 0.0700  | 3.2407  | 0.0175 | 1.8568  |
| 12.96 | 50.00  | 12.9414 | 0.5595  | 6.4780  | 0.1400 | 7.4274  |
| 13.23 | 49.00  | 13.2037 | 0.5944  | 6.6099  | 0.1487 | 7.7336  |
| 13.50 | 48.00  | 13.4766 | 0.6322  | 6.7472  | 0.1582 | 8.0592  |
| 13.79 | 47.00  | 13.7610 | 0.6734  | 6.8904  | 0.1685 | 8.4058  |
| 14.09 | 46.00  | 14.0574 | 0.7181  | 7.0397  | 0.1797 | 8.7752  |
| 14.40 | 45.00  | 14.3667 | 0.7670  | 7.1956  | 0.1919 | 9.1696  |
| 14.73 | 44.00  | 14.6897 | 0.8203  | 7.3586  | 0.2053 | 9.5911  |
| 15.07 | 43.00  | 15.0273 | 0.8787  | 7.5290  | 0.2199 | 10.0424 |
| 15.43 | 42.00  | 15.3804 | 0.9428  | 7.7075  | 0.2360 | 10.5263 |
| 15.81 | 41.00  | 15.7501 | 1.0132  | 7.8946  | 0.2536 | 11.0461 |
| 16.20 | 40.00  | 16.1377 | 1.0908  | 8.0909  | 0.2731 | 11.6053 |
| 16.62 | 39.00  | 16.5442 | 1.1766  | 8.2972  | 0.2946 | 12.2080 |
| 17.06 | 38.00  | 16.9711 | 1.2715  | 8.5141  | 0.3184 | 12.8590 |
| 17.52 | 37.00  | 17.4199 | 1.3768  | 8.7426  | 0.3449 | 13.5635 |
| 18.00 | 36.00  | 17.8922 | 1.4941  | 8.9835  | 0.3743 | 14.3275 |
| 18.52 | 35.00  | 18.3897 | 1.6249  | 9.2379  | 0.4073 | 15.1579 |
| 19.06 | 34.00  | 18.9142 | 1.7715  | 9.5068  | 0.4441 | 16.0626 |
| 19.64 | 33.00  | 19.4680 | 1.9361  | 9.7917  | 0.4856 | 17.0509 |
| 20.26 | 32.00  | 20.0531 | 2.1216  | 10.0938 | 0.5323 | 18.1332 |
| 20.91 | 31.00  | 20.6719 | 2.3313  | 10.4147 | 0.5852 | 19.3220 |
| 21.61 | 30.00  | 21.3269 | 2.5694  | 10.7561 | 0.6453 | 20.6316 |
| 22.35 | 29.00  | 22.0207 | 2.8406  | 11.1201 | 0.7139 | 22.0790 |
| 23.15 | 28.00  | 22.7561 | 3.1509  | 11.5087 | 0.7926 | 23.6842 |
| 24.01 | 27.00  | 23.5358 | 3.5074  | 11.9243 | 0.8831 | 25.4711 |
| 24.93 | 26.00  | 24.3623 | 3.9188  | 12.3697 | 0.9878 | 27.4681 |
| 25.93 | 25.00  | 25.2379 | 4.3959  | 12.8478 | 1.1096 | 29.7095 |
| 27.01 | 24.00  | 26.1641 | 4.9516  | 13.3620 | 1.2520 | 32.2368 |
| 28.18 | 23.00  | 27.1413 | 5.6024  | 13.9159 | 1.4196 | 35.1010 |
| 29.46 | 22.00  | 28.1678 | 6.3681  | 14.5132 | 1.6179 | 38.3645 |
| 30.86 | 21.00  | 29.2387 | 7.2739  | 15.1583 | 1.8541 | 42.1053 |
| 32.41 | 20.00  | 30.3435 | 8.3504  | 15.8550 | 2.1375 | 46.4211 |
| 34.11 | 19.00  | 31.4634 | 9.6355  | 16.6071 | 2.4799 | 51.4361 |
| 36.01 | 18.00  | 32.5660 | 11.1748 | 17.4171 | 2.8965 | 57.3099 |

## Pictures From 2018 Show & Sale

As usual the show was set up the Friday evening and early Saturday before it was opened to the public. Below are pre-show pictures as vendors and display layouts were being setup. This was our first year at Belvidere North High School. [see comments on show Doug Loy article-ED.] It was also the first year that the Show had a special Kids' Korner for younger children participation. Along with the Kids' Korner this was the first-year high school student volunteers and boy scouts were used to help us setup, take surveys, help our members distribute tickets, and help to run children activities. By doing this, they earned community service credits or boy scout merit badges. Among other first, member wives volunteered in the Kids' Korner working with children on various projects.



Setting up Display Layout



Setting up main floor Saturday Morning



Martha Reinert and Francys Johnson Setting Up Kids' Korner

Other wives who volunteered were:

Beki Marshall, Bev Laske, Harriet Loiselle, Kathy Welte and Tami Giersch

This was the first year for Kids' Korner as well as wives volunteering and high school students and boy scouts helping. All were viewed as great successes.



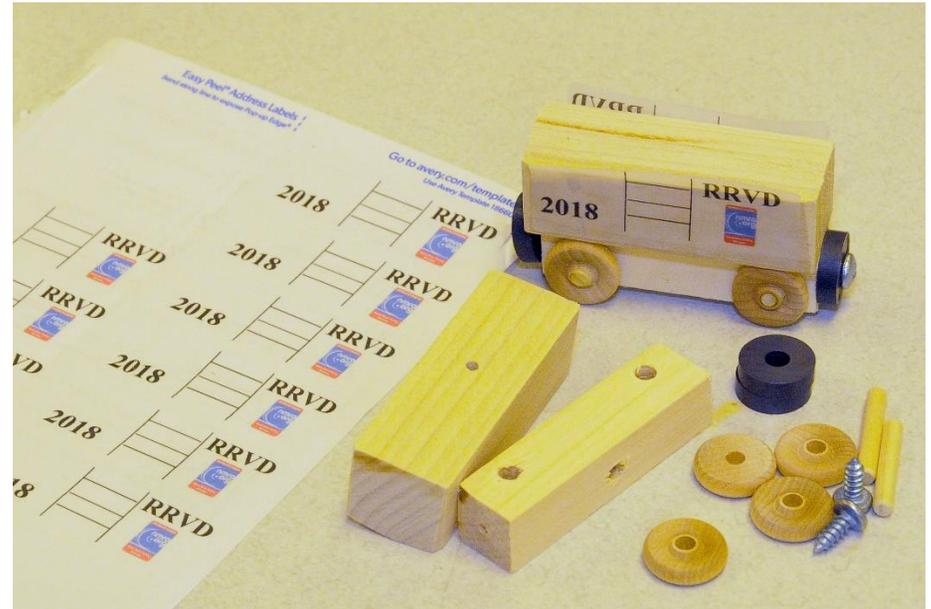
Above Madison a high school student showing a little girl how to build a Thomas style train car. Below visitors to Kids' Korner.



Kids coloring train pictures and doing paste up train style artwork.



James DeVoe letting child run trains.



The parts to make a train car.



High school volunteers with young girl building train car.



Mother and boy checking out train coloring books.



Don Brindle and Doug Loy holding down the fort and both are still awake during a long day.



Gary Loiselle with his display.



Tom Welter waiting for customers.



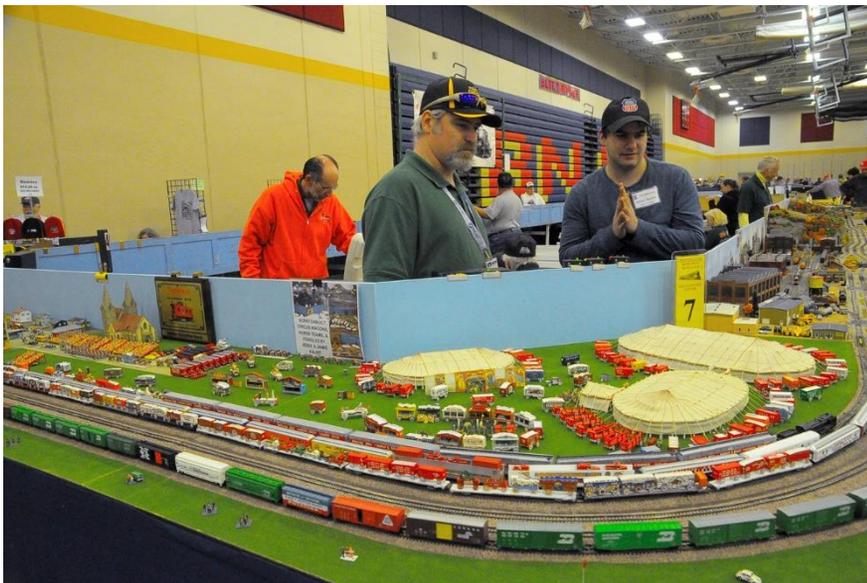
Bruce Giersch talking to Keegan who did a clinic at our convention on how to interest young people in model railroading.



One of the many display module layouts.



One of the many finely detailed pieces of rolling stock on display.



Large circus display on modular layout.



Lucky winner of a trainset door prize.



Doug Loy presenting plaque to the Pen Kathy Lionel from Hampshire winner of favorite layout.



Randy trying to make a last-minute sale.



Volunteer showing young boy how to blow the horn at grade crossing.

At each meet we have a contest on various aspects of model railroading. Shown below are pictures of cars showing post service life uses.



Caboose cottage post service life contest winner.



Boxcar used for crew office



Boxcar used for storage



Water tank service structure contest by Jim McQueeny



Coaling tower service contest structure winner by Jim McQueeny



Rip track terminal service contest by Clarence Welte.

## Layout Tours

After each meet the group is invited to tour various layouts open for visitation. Shown below are views taken during our visits. Below Bill Mulford adjusts a locomotive on Garden Glenn Western G-gauge layout.





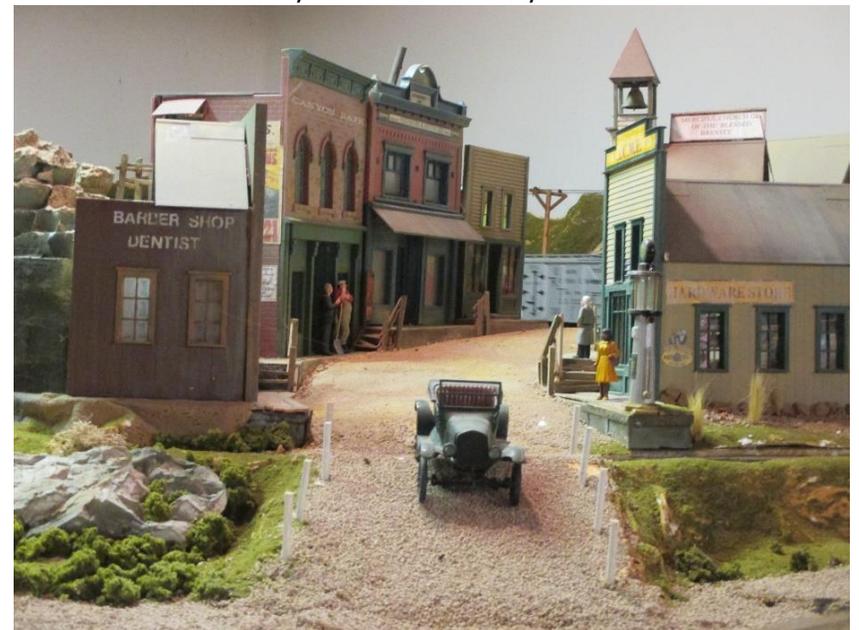
Monster sized articulated locomotive makes the ground shake as it roars by. You could place an N-scale loco on its running board.



There were many saloons and bawdy houses in that era.



Street scene 1920s Colorado.



When you build these structures, you can use real lumber.



Engine terminal. The sound of these locomotives made it seem like real steam locomotives were down in Bill's basement as you entered his house.



Station with passengers waiting for the next train

Another layout we visited was Tom Welter's Chicago, Memphis, New Orleans in HO-scale. It occupies a large 40 x 50 ft. former repair garage.



The layout has over 900 ft. of track covering two levels as seen below.





The boys checking out one of the large yard areas.

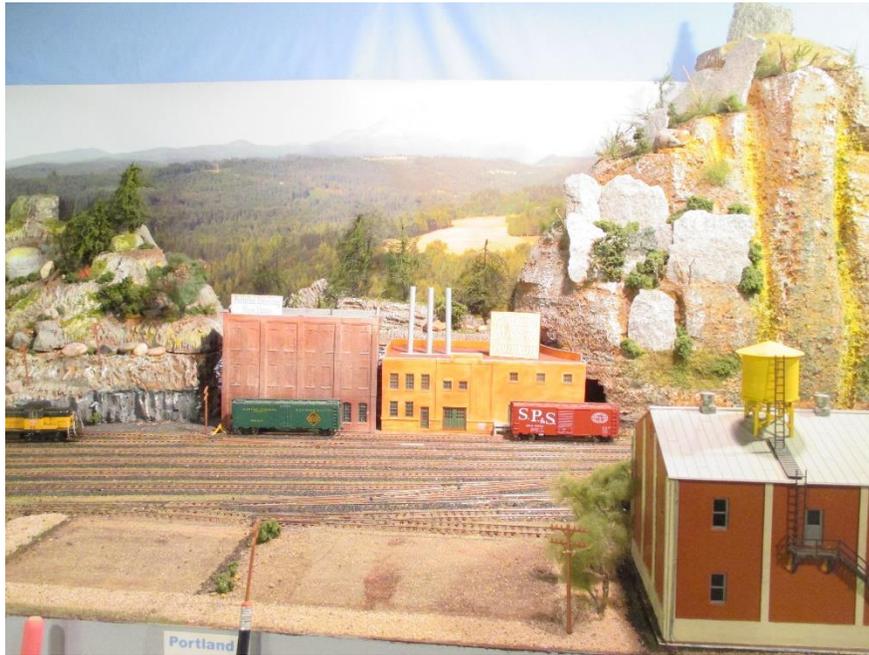


Clarence Welte checking out trackwork while operating a train on Ron's layout. I wonder if he had the correct locomotive addressed on his controller? Somehow a locomotive landed in the turntable pit.



Ron Johnson's Spokane, Portland & Seattle new expansion.





Ron has started scenery on his extension. Notice photo background.

## Clinics Held at Meets



Attorney Adam Agnew gave a presentation to our group concerning how to address the disposition of our model layout or collections after our death. In other words, things to do now so that your family knows your wishes before you die



Clarence Welte discusses institutions to which you can will your models.



Ken Reinert explains the use of "Homosite" for roadbeds during a clinic, "Tricks he Learned while Model Railroading."



An Example of a Caboose Rich showed of a photo he took in Rockford



Rich Mahaney presented two clinics. The first was "Second Lives of Caboose" in which he showed numerous pictures of cabooses in various uses. He suggested building a foot square module of a caboose in second life. This project will be the focus of our November model contest. (see contest list by month)



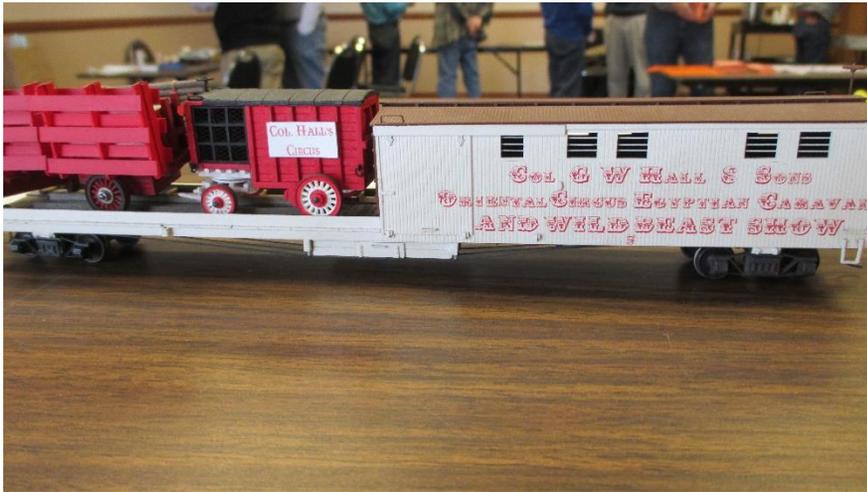
Rich's 2<sup>nd</sup> clinic was the things necessary to give a good clinic. He talked about topics of interest to the audience, good photographs, audience participation and using the proper equipment for the presentation.

The RRVD ended the 2017/2018 season by a group going to Madison Wisconsin to join the SCWD for their May meet. The group carpooled from Rockford and rendezvoused at a food court in the shopping center near the Zor Temple where the meet was held. Shown below are pictures sampling the various food offerings.



Pictures of one of the layouts visited under construction. Note the beautiful soffit work and lighting with blue and white bulbs to provide for day or night lighting effects.





Ken Mosny took first place award for "other" open loads category.



Ken Reinert took first place for open loads flatcar category.