

Locomotive painting

Painting and weathering starts with a philosophy/by Jack Burgess

Locomotive painting is one of the procrastinator's favorite projects—the fear of ruining a large investment in an expensive brass imported locomotive will provide an excuse to postpone the project indefinitely. Re-occurring nightmares of runs and orange peel finishes help solidify this entrenched position. Add to this a lack of solid information on proper weathering and the armchair modeler has another companion. However, new products and ideas can simplify this task and make the result personally satisfying. But, before jumping in with both feet (or hands), let's first study the prototype that we wish to duplicate.

A prototypical locomotive finish can be described by listing the color (is it gray or really black?), gloss (dull or high sheen?) and amount of weathering. A modeler's choice of these options has been a controversy reminiscent of the great coupler debate. However, it has been less vocal, possibly because it involves the question of personal taste and workmanship. The opponents have crystallized into those who finish a paint job with a gloss or semi-gloss varnish coat and those who weather a locomotive to the point of abandonment. Likewise, there are those who insist that locomotives were gray, not black, and those who use Engine Black straight from the bottle. It is obvious that, before beginning, we must decide on the questions of color, sheen and weathering, or more properly, degree of weathering.

To answer these questions and make these choices, we need to study our prototype with a suspicious eye. This caution is necessary because of two major factors—the limitations of black and white photography and the

limitations of the railfan era. In this day of inexpensive color films, many modelers are just not that familiar with black-and-white photography, the author included. However, exposures in black and white are based on the concept that pure blacks and pure whites will generally print as a shade of gray. Only by actually under-exposing a negative 1½-2 stops, (or taking a light reading directly from the black object rather than from the average scene), will blacks appear as black. See handbooks by Kodak and others for more enlightenment on this subject.

This quirk of photography has partially led to the position that our prototype was a shade of gray. This opinion has been reinforced by the modeler's rule that one should never paint a locomotive pure black. However, rumor to the contrary, locomotives were initially painted black. This conclusion is confirmed by ex-steam railroaders and at least for my own prototype, the Yosemite Valley Railroad, by Kodak slides taken by railfans in the late thirties and early forties. We will cover the problems created by using pure black later on.

The concept of locomotive sheen is clouded by the second limitation—the railfan era. From my own research on the YVRR, railfans usually arrived on the scene late in the dying days of steam rather than during the twenties and early thirties. Therefore, it is easy for publications to be overloaded with photographs from the period when steam locomotives were being phased out and shortlines were petitioning for abandonment. In fact, it was many times only the rumor of imminent abandonment which brought out the railfans with their cameras. Therefore, an

abundance of photographs from this time period now often results in the belief that all steam locomotives were initially painted a weathered, flat, chalky gray/black and leaked water and steam from every joint and wash-out plug.

But consider for a moment a more realistic viewpoint. In 1922, a new superheated Baldwin 2-6-0 would cost a railroad over \$27,000. That's equivalent to about \$94,000 in today's money. An investment of that magnitude was not allowed to casually deteriorate. While it was probably easy to allow the paint to peel on the back side of the roundhouse, a road's locomotives were its pride and joy. When steam leaks were discovered, they were promptly repaired before additional problems developed. Running gear was steam-cleaned regularly to prevent unnecessary wear and to facilitate inspection. Wipers were many times employed as a matter of pride and good public relations.

These considerations lead me to re-examine my own collection of Yosemite Valley Railroad prototype photos, separating those taken during the more profitable years from the ones taken during the last few years. From this review and discussions with former YVRR employees and knowledgeable railfans, I arrived at the conclusion that Fig. 1 and 2 more closely illustrate the car embellished on the steam locomotive by employees who prided themselves in their work. For proof that even some lumber companies also cared, study the photos in Allen Krieg's *Last of the 3-Foot Loggers*, particularly the photo reproduced on page 70.

By studying Figures 1 and 2, it becomes obvious that areas which are easy to wipe

PHOTO BY THE AUTHOR



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down and not subject to heat are well maintained and glossy. These areas include the cab and tender sides, steam and sand domes, and air reservoirs. The boiler itself (but not including the legs of the firebox or the smokebox) is covered with asbestos lagging and a sheet metal cover. The lagging effectively controls most heat loss from the boiler, but the boiler is difficult to keep completely spotless; pipes, pumps and other appliances hinder a thorough cleaning job. The combined result is a boiler with a semi-gloss sheen. The running gear is also semi-gloss, with deposit-type lubrication compensating for repeated steam cleaning. The smokebox, smokebox door and stack are subjected to direct heating and will be flat black (if painted at all) unless an oil and graphite application is maintained. The cab roof and areas subjected to foot traffic such as the pilot deck, running boards and the tender top will all be weathered from lack of maintenance and wear.

Weathering follows a logical pattern also. Notice that the trucks and pilot wheels accumulate road dust, while the drivers and running gear are kept relatively clean. Horizontal surfaces also collect dust unless wiped. These include the running boards, pilot deck, tender areas and cab roof. While the top surface of the boiler would logically collect dust, the effect is overshadowed by soot from the stack and periodical wiping. The soot effect is especially prevalent on coal-fired engines, but also shows up on oil-fired locomotives. Sanding the flues, running with wet steam and firing up in the morning will result in a shower of soot over the smokebox, top of the boiler and the cab roof.

The total result of all these combined effects is a locomotive with the appearance of good maintenance while at the same time earning its keep on the railroad. This is the effect I wish to duplicate. Now, whether I have convinced you or not, (some techniques will be common to all final results), get out an engine and let's go to work.

Going to work

Disassembly of the locomotive is the first step. However, even before this initial step, I would suggest gathering a few extra springs and screws for the loco and keeping them handy. No matter how careful I was, I immediately lost a driver spring upon removing a wheelset and thus introduced a delay later in reassembling my 2-8-0.

As you disassemble your model, keep notes if necessary about which screws go where, which parts slide in first and last and how to correctly position the drivers so that the insulated side will later be correct. Re-

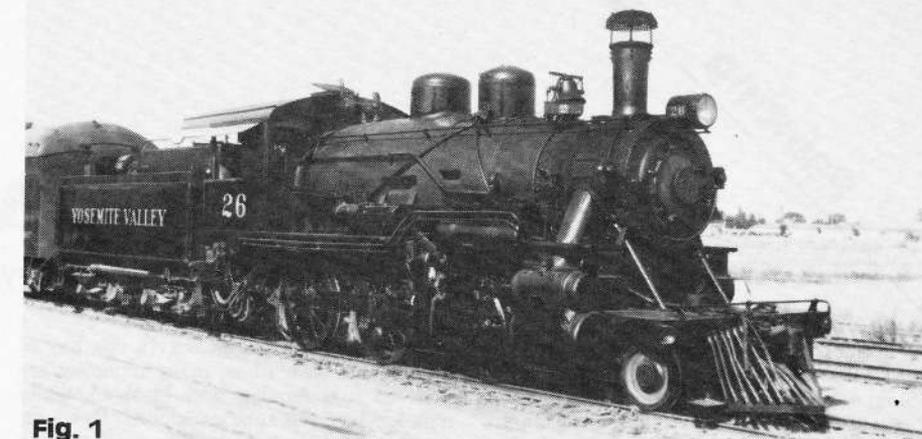


Fig. 1

PHOTO BY B.H. WARD

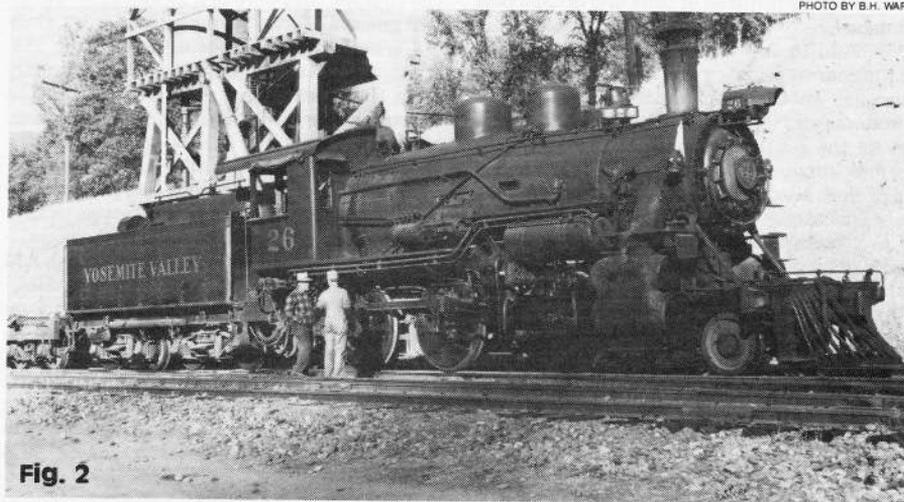


Fig. 2

Yosemite Valley Railroad No. 26, (top) at Merced Station in May, 1940, shows off a glossy sheen on the tender sides, cab sides, cylinders, and domes. However, note that the smokebox is sooty. (Above) Number 26 is pictured two years later, slightly more weathered and sooty. (Below) YVRR No. 23 shows variations in sheen and weathering similar to the top photo of No. 26.

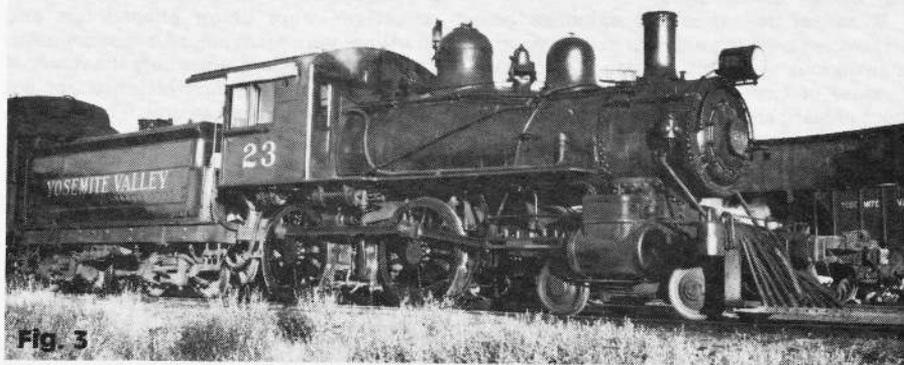


Fig. 3

PHOTO BY LARRY HARRISON

move any boiler weights, headlight lens and/or bulbs, and marker jewels. Wheelsets should be removed from the tender trucks. All parts should be kept together in a tray or box so they won't get lost under other projects. Alnico magnet type motors should be stored away from other magnets or steel. If the model has previously been painted, strip it using MEK or a commercial stripper; water soluble types are the easiest to use. If you have one, a Water Pik can be used to blast loose paint from crevices. This operation is

however best executed out-of-doors to prevent execution of the executor.

Proper paint adhesion depends primarily on a clean surface. For years, this meant a hot, sudsy bath and a dip in household vinegar to "etch" the metal. While the first step always seemed a good idea, the vinegar bath always seemed a waste of good vinegar; vinegar is just not strong enough to produce any noticeable effect. Ultrasonic cleaners are nice, but not always the type of appliance the average modeler has around. Russ Simpson,

the modelmaker and manufacturer, has obviously done some creative thinking about this dilemma and several years ago began using photographic tray cleaning chemicals in lieu of the vinegar. These chemicals produce a very light etch and completely remove the brass oxides. Russ recommends Atchinson tray cleaners; I couldn't find this locally and used instead Lauder Chemical's Tray Cleaner Concentrate, selling at about \$1.25 per quart, with excellent results. About a half of a pint is sufficient for a single locomotive.

Begin by washing the disassembled brass parts in hot sudsy water and rinse. Pour enough tray cleaner into a glass tray or container to cover the largest single piece. Since the tray cleaner is an acid, handle it appropriately, following the directions on the container. One by one, dip the rinsed brass parts in the tray cleaner using an old pair of tweezers. Leave them in the cleaner for only about ten seconds or so, until the brass stains have disappeared—the time necessary will be obvious. Rinse the parts immediately upon removal from the cleaner and then completely wash them again in hot sudsy water. After a second thorough rinse, bake them in an oven at the lowest possible setting for sufficient time to completely drive off all traces of water. (You did assure yourself that there are no plastic or wood components on the model, didn't you?) Do not dunk drivers or wheelsets—the light etch will eventually result in the tires collecting more dirt and grime from the track.

From now on, all handling of the model must be accomplished with extra clean hands, free of all oils, or plastic gloves. To lessen electrical problems later on, all contact points should be masked prior to painting. These include driver axle slots, truck bolster and motor mounting points, axle journals and drawbar contact points. I use both masking tape strips and squares and masking latex paint such as that made by Cary, whichever best suits the situation. Unless previously removed, also mask the bell and whistle.

When the masking is complete, mount the individual parts on wood sticks or blocks so as to securely hold the pieces while painting. A 1"×2" jammed into the boiler will many times take care of this sub-assembly; other pieces can be similarly handled.

For years I have been dedicated to primer and Floquil. While I still use Floquil for many projects (including weathering on this model), I recently switched to Scalecoat for brass models. This switch is due to the fact that with a clean model, a primer coat is unnecessary with Scalecoat. This eliminates a second coat of paint on the model and also reduces the amount of time necessary for the entire job. Scalecoat dries to a very hard and durable finish which is especially suitable for locomotives which are handled more than desirable. Scalecoat Black goes on as a high gloss (they refer to it as semi-gloss) finish which is perfect for later application of decals or dry transfer lettering.

I use a Badger Model 200 airbrush for painting. Previously I used the economical Badger model. While it is not possible to use this latter airbrush for fine weathering, it will still do a satisfactory painting job with care. If you don't have a good airbrush, seriously consider getting one. Good tools will always return the investment in good workmanship.

While Scalecoat recommends a 3:1 ratio of paint to thinner, I have found that proportion to be way too thin and use instead something more on the order of 5 or 6:1. I'm not sure of the actual proportion, because I just add thinner until the consistency is about right.

Color selection is up to you. Hopefully I have encouraged you to consider a more realistic pure black. I used Scalecoat Black No. 10 without white added and am pleased with the final results. Before beginning, I actually added white to the black to conform to the ancient rule that locomotives should not be painted black. However, the mixture did not look right and I stuck with straight black. While I realize the non-black rule is based on the usual lack of sufficient lighting in layout rooms, the selection of a mixture of sheens compensates for the deficiency.* If you are still unsure of straight black, Bob Schlechter provided another suggestion worth considering. Using the drop procedure to keep track of proportions, keep adding white to a known amount of black until you can just distinguish the mixture as gray and not black. Then back up a few drops toward the black. The result should be a gray which still appears black and is also a compromise for our under-lighted layout rooms.

Load up the paint jar and test spray as you set the paint flow with the needle adjusting screw. So you won't forget later, first spray paint a brass test scrap for use later in checking the progress of the baking operation. With the regulator set at about 15 lbs., move on to the tender and locomotive. Always spray hard-to-reach areas first, such as inside cabs and behind air pumps. This will help eliminate runs later on as might occur if these areas are sprayed after broad surfaces are painted. Build up the paint gradually, with several light coverages, to avoid runs. Work under a bright light to insure that no areas are missed. Once the difficult areas are covered, complete the open areas with long sweeping passes, always starting and stopping a pass *beyond* the model. The 15 lbs. pressure assumes an air brush-to-model distance of 6-8". If you need to move in closer, cut the pressure and reduce the area of coverage.

As the pieces are completed, carefully place them in a disposable pie tin (or a regular pie tin covered with aluminum foil.) When all the pieces are finished, place the pie tin and pieces together with the brass test scrap in an oven or toaster oven at the lowest setting. The baking process is the key to a durable finish. The process works slowly at first, then apparently grabs and sets. I baked my model about four hours. The test scrap will allow you to check the process. Once the paint has grabbed, the finish will feel dry and hard.

While waiting for the baking, it might be well to discuss proper airbrush maintenance. Again, Bob Schlechter provided the information based on discussions with sales representatives from Badger. Start by pouring any remaining paint back into the original bottle, unless it has been contaminated with other colors. Wipe out the bottle and other

*The exception to this recommendation is if you decide to use a flat finish. In that case, I would recommend you add some white to the mixture or you will lose detail. With semi- and pure glossy finishes, I stick to the pure black.

exposed areas with the corner of a paper towel. Remove the jar gasket and place it on another paper towel. Adjust the needle until it no longer protrudes from the tip. This step will relieve the vacuum in the gun and release any paint in the suction tube. If you remember, you will perform this operation over the paint bottle. Otherwise, the next step is to wipe the dropped paint off of your shoes and the floor. Place a finger over the nozzle and lightly touch the trigger, forcing any remaining paint out of the suction tube.

Fill the paint jar about half full of thinner (compatible with the paint brand), replace it, and spray onto a paper towel until you are sure all traces of paint are gone. You can spray this thinner onto the gasket at the same time, cleaning it in the process. If necessary, you can clean your shoe in the same operation.

If you are just changing to a different color, this cleaning is sufficient. If you are cleaning up to put the airbrush away, we need to keep going. While the thinner rinse took care of the paint residue, thinner residue still remains. To rid the gun of these residues, rinse out the paint bottle and fill it half full of a mixture of 50/50 water and ammonia and spray this through the gun. I keep a plastic pint bottle of this solution on the workbench for this purpose. As can be expected, this solution will eliminate the thinner but leave some ammonia. This must be removed or it will pit the metal parts of the air brush. So rinse the paint bottle one more time with water and run a half bottle of clear water through the gun. Remove the bottle, kick the pressure up to 40-60 lbs. and continue to spray air until all water vapor is eliminated.

While this may seem like a complicated procedure, keeping the ammonia solution and clear water handy will increase your efficiency and reduce the process to a simple, automatic rundown. It will help keep the airbrush operating satisfactorily and eliminate the need to completely disassemble the air brush each time, which can lead to air leak problems due to destruction of the fragile internal gaskets along the needle. Air leaks cause air to be blown into the paint bottle, leading to total frustration.

After the baking is complete, let the model sit another day before proceeding with the application of any sheen-reducing varnish coats. Begin this step by masking those areas which are to remain glossy. These are the sides and rear of the tender (but not the top), sides and front of the cab and domes. The masking of the cab sides should extend to the rain gutter and if possible, result in a blended line between the glossy side and the flat, weathered roof.

The only match line between the flat areas and semi-gloss areas is the rear edge of the smokebox. Mask this line also, with the tape on the boiler side of the line. With a good air brush, it is unnecessary to mask the entire boiler.

I use Micro Flat and Micro Gloss mixed 50/50 for producing the semi-gloss. The Micro Flat is used alone for the dead flat finish. Very little Micro Thinner is required for airbrushing these applications. Begin with the flat finish, applying it to the smokebox, smokebox door, stack, cab roof, top of the tender, frame (but not to any air tanks mounted to the frame), pilot deck, wheel sets and drivers, trucks and any exposed portions

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of the firebox below the running boards and/or cab.

Strip off only the masking tape protecting the boiler from overspray from the smokebox and mix up some semi-gloss 50/50. Spray this onto the boiler lagging. The match to the smokebox can be accomplished without masking with a steady hand. When complete, set everything aside to dry completely. Leave the gloss protecting masking tape in place until the first step of the weathering process is complete.

While there are obviously some prototypes with chromed rods and valve gear, they are not as common as our brass reproductions would indicate. I choose to duplicate the more common blackened running gear. Hobby Black No. 2 was used, rather than paint, as paint has a tendency to chip under use, resulting in a very unprototypical speckled effect. Clean all of the valve gear and rods, including the screws, and then dunk them in the Hobby Black, following the directions on the container. If you are positive that certain pieces are solid construction and not soldered, warm them first in the flame of a butane torch before dunking. This will result in more complete coverage in less time. Don't be misled by things such as cross-heads—they are tough to solder back together after they fall apart in the torch flame.

Once the flat finish and semi-gloss finish have set up sufficiently, the initial weathering step can begin. We want to very slightly lighten those areas hit with the flat finish. As you have noticed, the details which remained

glossy continue to stand out; details which have to be sprayed flat have essentially disappeared. Further lightening will take place later with some pastels, but that step is reserved for small details such as builder's plates and piping. For now, we need to go for the overall effect.

For this, I use Floquil Engine Black mixed with some Reefer White. Airbrush the flat areas, trying for the subtle color variations in the process, to make details stand out. For example, on an oil burner, the entire top of the tender, including the oil tank should be lightened slightly to duplicate both dust and the effects of walking on the tender to reach the water hatch. But, to create the desired subtle color contrasts, allow the edges to remain darker than the center, higher traffic areas. Now add a little more white to the mix and lightly hit details such as the water hatch, rear headlights, tool boxes, etc. This latter application does not duplicate the prototype necessarily, but highlights those details we worked so hard on.

With a lighter base to work against, strip all remaining masking tape and load the air brush with pure black Floquil. With a narrow spray pattern, add a black soot line down the top length of the boiler, cab and tender. This is the soot which is blown out when running under a black exhaust. Keep the line narrow but blended, especially over the cab and tender or you'll be back to the flat black we started with a few minutes before. If you intend to handle the model with care, spray this "soot" using Floquil Engine Black straight from the bottle, rather than with the normal 3:1 dilution with Dio-Sol. Adhesion is not that great when sprayed this way, as the paint dries before contact, but the result is a very realistic soot.

Once this last application has set up, lettering can begin. If you are using commercial decals or dry transfers, simply follow the manufacturer's directions. I used some custom dry transfers made from original artwork. To guarantee that the lettering is parallel with the bottom edge of a tender or cab side, use a set of sharp dividers. Set the lettering in approximately the correct location and check the distance to the bottom edge of the side at both ends of the lettering. Fix the

lettering with a light coat of Micro Gloss. This is an exact match for Scalecoat Black's sheen and it is therefore not necessary to cover the entire surface with the application, but only the lettering to be protected.

With a brush, paint the interior of the cab with Floquil Light Green. Window and door frames can be hand painted a flat, weathered red (a common practice) using a mixture of Caboose Red and Reefer White. Paint the arm rests in the cab a glossy brown (use Testors Pla.)

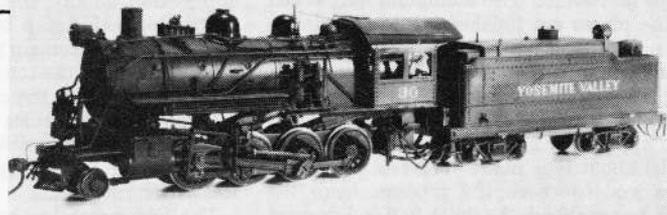
As you finally reassemble your creation, lubricate where appropriate and polish electrical contact points to guarantee electrical continuity. To further insure that the masterpiece will run as good as it looks, add rail wipers for both rails. See Fig. 4. These are constructed from .005" phosphor bronze. One is soldered or screwed to the gear cover plate and another to one of the tender trucks, each set to wipe different (and appropriate) rails. Stalls due to dirty rail are nearly totally eliminated with these little jewels, as rail contact no longer depends entirely on clean drivers. Visualize the actual contact area between a driver tire (round) and the railhead (flat) and you'll wonder why such a primitive method works at all. Wipers are also essentially self-cleaning as they slide along the rail rather than roll and collect dust and dirt. Add a flexible wire to supplement the drawbar connection and 99% of your problems will disappear. Several firms make sliders, should you wish to use a commercial product.

Finish reassembly with the addition of headlight lenses, marker light jewels, poling poles, couplers, bell and whistle and cords. The latter is easily duplicated with a strand from stranded electrical wire dipped in Hobby Black. Finally, test run the loco.

Final weathering is that produced by road dust and final highlighting. Because we are duplicating road dust thrown up from the track, it has been necessary to save this step until the model was assembled. I use a mixture of Floquil Mud and Floquil Reefer White. Very, very lightly hit the bottom portion of the tender (remember, the tender was wiped down within the past day or two) and likewise the drivers and rods. I re-emphasize the lightly—I overdid the drivers and had to go back with some black to hide it. The tender trucks and pilot wheels can be weathered severely. Again refer to prototype photos.

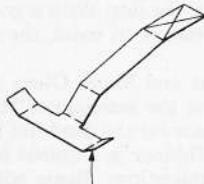
Finally, use soft pastel chalks to add some small, subtle highlights to details. My favorite areas are piping, pumps, generator, builder's plate, etc. Also use the pastels to weather the pilot deck and running boards; these are difficult to weather satisfactorily with an airbrush. Most of this weathering is done with gray, although some rust is used where appropriate. Unless you have used decals in the number boards, use white pastels to add the illusion of glass in them. This is better than using white paint, which stands out too well. Likewise, add a hint of red to the smokebox door number plate—again, the subtle hint is enough. For a bit of contrast, add a touch of rust to the tender deck around the water hatch.

One final suggestion. The YVRR used only oil burners; if yours is a coal burner, consider one more indication that your locomotive is earning its keep. Rather than have every locomotive with a full tender of coal, why not a few with the coal bunker only half full? ☞

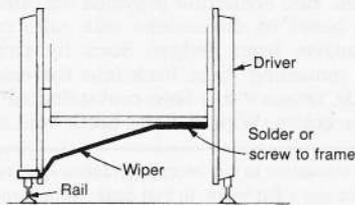


Wiper

Solder or screw to the frame. By tapping the gear cover and using an elongated hole in the wiper, minor position adjustments may be made over the rail.



The width of the slider portion must be wide enough to maintain rail contact but not too wide to short out at the switches.



Cross section through frame

Fig. 4