



**ACCUCRAFT TRAINS**  
MUSEUM QUALITY BRASS MODELS



**D&RGW C-25 2-8-0  
COAL FIRED  
INSTRUCTION MANUAL**

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## History of the D&RGW C-25 Class Locomotive

This Baldwin-built locomotive, a 2-8-0 or Consolidation type, was originally numbered #103 of the Crystal River Railroad, a narrow gauge line located in the Elk Mountains of central Colorado. It was built and delivered in 1903 as construction number 21757 of the Baldwin Locomotive Works, had 33" drivers, 18x20" cylinders, and a tractive effort just short of 25,000 pounds. It was a standard Baldwin design, and other narrow gauge locos of this size and type were built for railroads in the Western Hemisphere. The D&RG purchased this locomotive from the Crystal River in 1916 and numbered it #432. It was renumbered in 1924 to #375. Originally the locomotive was a class 112, this number reflecting the total weight of the locomotive, but eventually the D&RGW changed the classification numbers of their locomotives to reflect their tractive effort, and thus the classification of C-25. Interestingly, for a while the cab of this loco carried "C-25-112" as its classification. The C-25 was affectionately known as the "Baby Mudhen" because its pulling power was close to that of the K-27 class, those engines being known as "Mudhens." When the engine was put into service in 1916, it was the best steamer on the railroad at that time. Sadly, on June 21, 1949 the one and only C-25 on the D&RGW was scrapped at Alamosa, Colorado.

## Introduction to Coal Firing

Firing and running a coal fired locomotive is an entirely different experience from that of a butane fired engine. Coal firing is a dynamic process that is continuously changing from moment to moment. The variables presented by temperature, humidity, track conditions, train load, firing technique, distractions and your attention to the firing process will make every run a new and challenging event. Although many of the elements of running your locomotive will be familiar to you from running a butane fired locomotive, coal firing introduces many new elements that require you to be continuously thoughtful and attentive.

Unlike a butane fired locomotive, you cannot set your coal fired C-25 running down the track while you casually stand by watching it perform or visit with onlookers; it needs your constant attention. Many butane locomotives will run out of fuel before water, and slowly come to a stop with no harm done. The functioning water level of a butane locomotive, with its usual single flue, located along the bottom of the boiler, is less critical than that of a coal fired boiler with a crown sheet. The crown sheet needs to be in constant contact with water to keep from being permanently damaged. This means you must devote yourself to being ever watchful of the water gauge. The combustion of coal is also a more intricate process than the burning of butane. Coal firing needs to be managed in a thoughtful manner; the regular stoking and proper management of the firebox is an absolute necessity to a successful run. Stoking the firebox, like maintaining water level, cannot be done in a haphazard manner.

## About Your Boiler

A good place to begin the firing process is to have a thorough understanding of your locomotive's boiler and how it behaves. The boiler in your locomotive duplicates a full size boiler in all aspects, including significant areas of flat surface. Construction includes 8 fire tubes and 1 flue, a water legged firebox, 5 bushings for mounting various fittings and a pass through for the blower pipe.

The major flat surfaces are the firebox front, sides and top, the boiler front sheet and the flat outside portions of the boiler wrapper surrounding the firebox. The firebox is surrounded by water legs on 3 sides, the back being dry. These flat surface water legs are supported against the internal pressures by copper rods or stays tying them to each other. The top of the firebox, or crown sheet, also basically flat, is supported from collapsing by vertical plates that connect it to the outer shell, or wrapper. The front of the firebox, or rear flue sheet, and the front of the boiler, or front flue sheet, are supported against boiler pressure by being connected to each other with the tubes and flue. The barrel of the boiler, being spherical, is self-supporting within the limits of its design strength.



Several of these boiler plates are flanged and all are assembled using a high strength, high temperature, silver bearing brazing compound. To maintain joint strength, those boiler plates exposed to the combustion process, and more particularly the crown sheet, must be in direct contact with and covered at all times by the water in the boiler. This means WATER LEVEL IS CRITICAL. To this end, the locomotive is equipped with an axle pump and hand pump and can also be optionally fitted with an injector or Goodall valve. It should be noted that injectors in smaller sizes are notoriously finicky devices, not generally reliable, and should NEVER BE RELIED ON for critical boiler feed .

The C-25 boiler is designed to function at a working pressure between 60 and 75 pounds per square inch. This pressure is continuously trying to collapse the crown sheet and inner firebox sides. The water level must be maintained above a point equivalent to the bottom edge of the blower pass through pipe at all times. The lower working limit for water level is the top of the lower nut on the water gauge. The installed axle pump is sized to pump water in excess to the needs of the engine, and given time, will fill the boiler to its maximum capacity. During those times the locomotive is stopped and the blower is on, makeup water needs to come via the tender pump.

Maximum water level is not critical, but should not exceed the bottom edge of the top nut of the water gauge. Over filling the boiler results in the engine priming, or passing water to the cylinders, and can be noticed by a spray or mist of water coming from the cylinder exhaust or blower stream exiting the smokestack. A more detailed discussion of maintaining water level will be presented later in these instructions.

### Coal Burning Processes

The combustion of coal in a firebox, and using the derived energy for steam production, is not a simple process. Coal is a complex material and its combustion is intricate. Coal, a mineral compound, contains, depending upon its specific type and source, various quantities of moisture, hydrocarbon volatile, ash, sulphur and fixed carbon. Coal needs a significant amount of heat to initiate and maintain combustion as well as a continuous supply of oxygen. Coal combustion takes two avenues. The first avenue takes place at a relatively low temperature and results in the combustion of the volatile hydrocarbon components. As fresh coal is added to the top of the burning bed of coal on the grates, the volatile hydrocarbons are gasified and driven off, burning in the space above the coal bed and producing hot flue gases that transfer their heat to the firebox, tubes and flues by convection, with minimal radiant energy. The second stage involves the fixed carbon portions of the coal bed situated on the grates.

The fixed carbon in the presence of a significant supply of oxygen burns at a high temperature, becoming incandescent in the process. This second process produces considerable amounts of radiant energy as well as additional hot flue gases. The sulphur component, which is relatively small, also burns producing a corrosive in the form of sulphur dioxide which, in the presence of moisture, becomes sulphuric acid. The ash, or non-combustible portion, composed mostly of clay, remains behind to form clinker, clog grates, drop into the ash pan and be deposited in the smoke box.

In small scale locomotive boilers the heating surface apportionment between the fire tubes and the firebox, coupled with the small diameter of the tubes and their relative short length, generally favors the firebox for absorbing the energy of combustion. Most of the heat value in coal is contained in the fixed carbon portion, and since the fixed carbon portion combust with a high level of incandescence, this energy is readily transferred to the boiler radiantly. This results in the firebox being the major contributor to the steaming capacity of the boiler.

The combustion of both the volatile and the fixed carbon portion takes considerable amounts of oxygen. This necessitates that the bed of burning coal have a sizeable amount of air passing through it to maintain combustion. This air is provided by the exhaust nozzle and a separate blower, both located in the smoke box. The nozzle, as the engine runs, and the blower when it is stationary, reduce the pressure in the smoke box which induces air to be drawn up through the grates and burning bed of coal, through the tubes and flue, and out the stack.

The main requirement for this to take place, is for the air to have a free and unobstructed passage through the bed of coal, and that the coal be evenly spread across the grates. Any obstruction to the flow of air or lack of



forced draft will cause the fire to go out. As well as obstructions, if there are large holes in the coal bed that allow air to circumvent passage through the burning portions of coal, combustion will be reduced. This is true also with leaving the firebox door open.

How you fire and run your locomotive needs to take into account how coal burns. The frequency of stoking, the quantity of coal stoked, how it is spread on the grates, as well as the quality of the coal, will all have considerable impact on how your locomotive performs. The specifics of coal firing will be covered in detail further on in these instructions.

### Selecting Coal, Water, and Oil

Your selection of coal, water and oil will contribute as much to the success of your coal firing experience as your firing technique.

#### Coal

As discussed above, coal is a complex compound and comes in many "flavors." Coal falls into 4 basic classifications, anthracite is a hard, shiny coal with a high heat content; in excess of 15,000 BTU per pound, and a carbon content of 85 to 95%. Next down the scale is bituminous. It is softer, has less carbon, 45 to 85%, has a heat content of 10,500 to 15,000 BTUs, and has less sulphur. Following this is sub-bituminous coal which contains upwards of 50% carbon, has a heat content between 8,000 and 13,000 BTU per pound, is softer and dull colored. On the bottom is lignite which is totally unsuitable for our purposes. All of these have other characteristics, depending upon their impurities and how they were formed millions of years ago, which impact their ability to be used in the small fireboxes of gauge one locomotives. These characteristics are less dependent upon their basic classification and more dependent upon the specific mine the coal comes from. Just because it is being used by some power company in a generating plant, does not mean it is suitable for our small firebox boiler.

Anthracite, bituminous and sub-bituminous coals can all be suitable for our uses. The single most important characteristic for our consideration is their ash content and their ash fusion temperature. Coals with high ash content and low ash fusion temperatures are prone to clinkering, clogging grates and forming masses that can blanket the bed of coal. In our small fireboxes this is especially problematic. As mentioned above, our boilers depend upon a significant transfer of heat radiantly. Anything which reduces radiant transfer, limits steam production greatly. Our small boilers also have a limited grate size, and anything that inhibits air flow will also inhibit steam production.

Whether you use anthracite, bituminous or sub-bituminous coal, you need to look for a clean burning coal that has low ash and is not prone to clinkering. The Welsh steam coal available from Coles' Power Models falls into this category. Although it burns relatively fast and needs more continuous stoking than other coals, it burns without much ash, no smoke, and more importantly it does not form clinker. It is also easy to break up into the smaller size pieces needed to stoke through the firebox door.

Of the 3 or 4 different coals we have tried, Coles' has been the most successful and easy to use, as well as the easiest to clean up afterwards.

#### Water

Your locomotive's boiler is an assembly of many components that have been joined using a silver brazing compound. These brazing compounds are atomically different enough from the copper in the boiler plates to be subject to electrolytic decomposition in the presence of an electrically active fluid. The water used in your boiler needs to be as pure as possible, and within a relatively narrow range of pH. pH is the measure of the ionic properties of a liquid material which classify it as an acid or a base. This is measured on a scale from 0 to 14 where 7 is neutral: below 7 is an acid, above 7 is basic. Acidic solutions have an abundance of H<sup>+</sup> (hydrogen) ions while basic solutions are strong in OH<sup>-</sup> (hydroxide ions.) It is the presence of these ions that makes the fluid electrically conductive. Freshly "STEAM DISTILLED" water will measure approximately 7. and is ionicly neutral, but with long term exposure to carbon dioxide in the air slowly will become slightly acidic with pH of around 6.



We often think of some natural waters as being very pure; for instance rain water, or "Pure Spring Water." It is true they may not have significant dissolved solids in them, but their pH can vary from acceptable to miserable. Just as we use acids and bases as electrolytes in batteries to pull electrons out of the metal battery plates, the pH of your water can cause electrolytic effects to take place in your boiler, which can cause the brazed joints to break down over time.

Distilled water that has been "DEIONIZED" is extremely active electrically and should NEVER be used in your boiler. Often water will be OZONATED to kill bacteria. Water that has been ozonated is acceptable as long as it has also been steam distilled.

**\*\*\*\* We recommend only the use of STEAM DISTILLED water in your boiler \*\*\*\***

### Oil

Since the beginning of the steam age there has been a heated discussion of which oils are best for cylinder lubrication. The development in recent years of a plethora of synthetic oils has only exacerbated this discussion. All the major oil companies now produce innumerable synthetics; yet they all still recommend similar, non-synthetic, oil and tallow blends for the use in saturated steam cylinders. Although these may carry individualized brand names, they are all a compounded ISO 460 heavy oil for use in steam cylinder environments. They have all been developed to resist being washed off the metallic surfaces by the action of water and hot steam, and all are designed to be carried to the necessary lubrication points by being entrained in the stream of steam. The oil companies also occasionally reference these oils as "AGAMA 7 Compounded" oils, and they also come in weights other than ISO ratings of 460.

Oil that meets this specific criteria is available from your Accucraft as well as from the bulk distributors of the various oil companies.

**\*\*\*\* We recommend only the use of the ISO 460 oils \*\*\*\***

Excess oil beyond that necessary to lubricate the valves and cylinders is detrimental to the locomotive.

Unlike a butane fired boiler, your C-25 does not have any holes or drain in the bottom of the smoke box. This means that excess oil delivery to the cylinders will become mixed with cinder and ash to form a sludge in the smoke box, besides forming this sludge, oil soaked cinder and ash can be carried out the stack to be deposited as an abrasive on the running gear.

## Accessories You Will Need

### What You Need To Obtain

1. Shovel and pick (sku#AP-28200) (provided), Flue Brush (sku#AP-28201) (provided), & Draft Fan (sku#AP-28202). These can be purchased from Accucraft dealers.
2. Charcoal

Coal needs exposure to heat to initiate combustion. The easiest way to do this is to build your coal fire upon a strong bed of charcoal embers. Charcoal is easy to ignite, especially when soaked in lamp oil, burns hot and reduces completely to ash. This makes it an ideal initiator for beginning the firing process. The charcoal you use needs to be "real wood" charcoal, not briquettes. This can be obtained at most barbecue supply stores as well as some gourmet cooking stores. It is also available from Lowe's Home Centers, under the brand name of "Cowboy Charcoal" in 20 pound bags. This charcoal is made from scrap lumber that includes both soft and hard woods. The charcoal pieces are fairly brittle, and can be easily broken up into the proper sized pieces using a



good pocket knife.

### 3. Lamp Oil

To ensure that the charcoal will ignite readily, soak it in a flammable fluid like kerosene or lamp oil. The better of the two is lamp oil, and preferably a clear unscented variety.

### 4. Lubricator Syringe

Useful for removing water and oil from the lubricator in between and after runs.

### 5. Gondola

To ease the chores of firing and maintaining your locomotive we RECOMMEND you purchase an Accucraft D&RG Gondola to connect behind the tender. The use of a gondola to carry your coal and fire from will save the paint on your tender, provide you a larger supply of coal, give you a place to put the shovel and pick and GREATLY REDUCE THE CHANCE OF COAL DUST CONTAMINATING YOUR WATER SUPPLY.

### 6. Paint Brush

Ash and the small cinder particles that accumulate on the exterior of your locomotive from running can be easily brushed off using a 1 1/2 to 2 inch wide bristle paint brush.

### 7. Vacuum

One of the components of all coal is sulphur. Sulphur burns producing sulphur dioxide, which combines with moisture in the smoke box to form sulfuric acid. To reduce the corrosive effects of sulfuric acid you should clean all of the accumulated ash and cinders out of the smoke box following every run. This can most easily be accomplished using a computer vacuum.

### 8. Solvent Cleaner

Following every 4 to 5 hours running time you will want to more thoroughly clean your locomotive, including the smoke box. We recommend you accomplish this by washing with "Stoddard" solvent. This product is designed for parts washing in the aviation and automotive industry. It is an excellent grease and oil remover, has a low flammability and leaves no oily films or residue, and absolutely will not damage the paint. It is available from your local Petroleum Bulk Supplier, either under the name of "Stoddard" solvent or as parts washing fluid. Most automotive machine shops can point you in the right direction to buy it.

### 9. Solvent Sprayer

The most convenient way to apply the Stoddard solvent is by using a pressure type garden sprayer. We recommend a HUDSON brand "Bugwiser Sprayer," model number 67220. This has a 2 gallon, stainless steel, canister, which is solvent resistant. These can be purchased from LOWES' HOME CENTER. One note about this sprayer and Stoddard Solvent. You will have to occasionally put some oil down the top of the sprayers pump barrel to lubricate the piston, as the solvent tends to wash away the pump's lubricant.



## Advanced Preparation

Before you begin firing your locomotive, you need to tend to some preparatory items. The first is to insure you have an adequate supply of properly sized coal. Your firebox door is 3/4 inch tall and 1 1/4 inches wide. The shovel is 1 inch wide, 1/2 inch deep and 2 inches long. Coal needs to be sized accordingly. Your lumps of coal should have an upper limit in size of 1/2 X 1/2 X 3/4 of an inch; 3/8 X 3/8 X 3/8 being ideal. Coal that is smaller, ie. lima bean sized is better. Any pieces smaller than a 1/8 inch cube can also be used, but only after a good bed of coals is established.

Your charcoal needs to go through this process also. Try for pieces about 3/8 X 3/8 X 3/8 of an inch. As with the coal we keep the bulk of the cut and broken up charcoal in a separate container. The charcoal is kept dry in this container, not oil soaked. About a quart of this charcoal is then put into a large coffee can with a tight fitting plastic lid and soaked in lamp oil. After putting the charcoal into the can, put in about a cup of lamp oil, place the lid on the can and tumble to expose all of the charcoal to the oil. This coffee can then becomes the container we fire the locomotive from on startup. We leave the oil in the can, and as we replace charcoal we have used with fresh charcoal, add oil as needed so that there is always a slight amount of liquid in the bottom of the can.

## Firing Your Locomotive

There is included with this set of instructions a "C-25 COAL FIRING CHECK LIST". This checklist covers the entire firing process, in abbreviated form, from setting the locomotive out on the track to putting the locomotive in long term storage.

After assembling all the necessary items, coal, charcoal, water, oils and tools, you need to find a spot to lubricate the locomotive and tender. Usually a table or other flat surface where you can place a folded towel to protect the locomotive when you lay it on its side. You need to oil the running gear on both sides, oil the axle boxes, the lead and trailing truck and the axle pump yoke and eccentric. Also put a drop of oil on the axle pump ram. The locomotive is then placed on the steam up bay track and the tender axles oiled in a similar fashion.

After placing the tender behind the locomotive on the track, connect the drawbar in its long position. Although you can run the loco with the drawbar in the short position, it is less convenient to stoke the firebox, there is less access room to reach the controls and it puts a more acute bend in the tender water lines.

Next connect the tender water lines. The return line slips onto the locomotive stub pipe about 3/16 to a 1/4 of an inch. The pump feed line screws onto the locomotive fitting. Before adding oil, check that you drained the condensate after the prior run by using your syringe or opening the drain. An easy tip for adding oil is to again use your syringe; fill the syringe with oil, insert the tube down below the cross tube and add oil to the proper level. This keeps oil from spanning across the gap between the lubricator sides and the cross tube and not draining down.

Water can now be added to the tender. Once the tender is full of water, you can clear the pump feed lines of air. Begin by ensuring that the boiler and gauge glass blow downs. the throttle and the blower valve are all closed. Open the axle pump bypass valve a half turn or so, and pump the tender pump 10 to 15 strokes. Close the bypass and pump the tender pump until the water level is 1/2 to 3/4 of the water glass. Leave the bypass closed.

**Do not overfill the boiler.** The water level will rise as the boiler is heated and comes up to steam pressure. This can cause the water level in the boiler to be so high that the boiler will "prime" or pass raw water to the cylinders when you first start the locomotive moving. Water can be released from the boiler as steam pressure builds by using the gauge glass blow down.

The most convenient way to fire your locomotive is from a gondola full of coal coupled up behind the tender. The gondola also provides a handy place to keep the fire pick and shovel. Fill the gondola about 2/3 full of coal and couple it up to the tender. After placing your suction / smokestack fan in a convenient place next to the front of the loco, fill the firebox with oil soaked charcoal level with the bottom of the door. This takes about 8 to 10 shovel fulls,



and should be spread out evenly in the firebox, side to side and front to back. Check that the blower, throttle and axle pump bypass valves are all closed. Place the fan into the stack, light the charcoal, and immediately turn on the fan and shut the firebox door.

You will now have a few minutes as steam pressure builds to about 10 pounds on the gauge. As soon as the gauge shows 10 pounds, add 2 shovels of coal, remove the fan and turn on the blower. The blower is much more effective at providing draft than the fan, and pressure will build very quickly; you should be able to actually see the gauge climbing. As pressure builds, you will need to turn the blower down slightly. At between 40 and 50 pounds pressure, add 2 or 3 more shovels of coal and open the cylinder drain cocks (the drain cocks are open in the down position).

The pressure should, by now, be approaching 70 pounds, and you can place the locomotive in forward gear, turn the blower down to a light level, but not totally off, open the throttle and proceed to pull out.

Let the locomotive run about 100 to 150 feet, then stop it to check the firebox. If needed, add enough coal to bring the level up even with the bottom of the door.

Also, now is the time to shut off the cylinder drain cocks, but leave the blower on at a very light level. Be sure to also check the water level on the gauge. If the water level is low add water using the tender pump or Goodall valve. This can happen because the usage of the blower while building steam pressure was not made back up, and the short run did not give the axle pump time to fill much. Double check that the bypass is closed, shut off the blower and you are ready to open the throttle and begin running in earnest.

You will need to keep an eye on the water gauge as the axle pump will begin to bring the level up towards the top nut. Because the level of the fire in the firebox is constantly changing states, from blanketed with fresh coal to a roaring fire, it is not practical to try to set the pump bypass to exactly compensate for consumption. When the level approaches the top nut of the gauge, open the bypass, when it approaches the bottom close the bypass. You do not need to stop the engine to open or close the bypass, it is easily manipulated on the fly.

After another 300 or so feet of travel, stop the locomotive, crack the blower on, and check the firebox. How often you need to add coal will depend on several factors. How hard the engine is working, the quality of the coal you are using and how much coal you added the time before. When you let the fire drop too low, the heavier blanket of new coal does not have sufficient heat available to readily begin combustion, and pressure will fall. This can sometimes be avoided by running with the blower, but regular and even firing works best

By now your locomotive should be completely converted over from the startup charcoal and you can begin a regular rhythm of stoking, checking the water gauge, and occasionally adding water to the tender. Keep an eye on the pressure gauge also. Proper pressure is dependent upon two things, the amount of coal burning in the firebox, and how vigorous it is burning. The amount of coal is controlled by stoking, and the level of combustion by the amount of draft. **These need to be kept in balance for how hard the locomotive is working.** The harder it is working the better the draft. If the safety is continuously popping off you can cool things down a bit by opening the firebox door for a short period, say 150 feet or so. If you run your locomotive slow with a light load you might need to crack the blower slightly while it is running.

As your experience increases, you will fall into a rhythm that is natural for you, your engine, the speed you run it and the load it pulls. You need to be always aware of what is taking place. The needs of the engine must come first. If you let yourself become distracted, combustion can drop off, water can get low, the tender can run dry and you can find yourself up the proverbial creek without a paddle. Enjoy your run, but stay on top of it too.



## Ending Your Run

Unlike a butane locomotive, you cannot just turn the burner off to finish a run. When it approaches time to quit, quit stoking, but keep the engine running as the combustion level drops. Adding water will also further cool the boiler down. Let the locomotive finish cooling down to a temperature that allows handling without discomfort. When the engine is cool enough to move around, hang the rear truck over the edge of a table and drop the grates with the unburned coal, ash and occasional clinker. There should not be any hot embers remaining, but on the off chance there are, it is best to hold an empty coffee can underneath the grate while you drop it. Shake the grates and ash pan out and use the grate retaining pin to clear any small bits that may be stuck in the spaces of the grates.

Before replacing the grates be sure to brush down the rear truck, and locomotive frame pieces that may be littered with ash. Replace the grate, and brush the accumulation of ash off the locomotive and running gear. This superficial brush down will suffice for a couple of hours between runs, but is not sufficient for overnight or longer storage.

## After Run Cleaning

When you are finished running your locomotive for the day, and will be returning it to storage, it will need a thorough cleaning, and re-lubrication. The extent to which you clean it will depend upon how long you have run it and how long it will remain in storage.

### AFTER EVERY RUN

- Remove grate / ash pan
- Place engine on table so that front truck and rear truck are on newspaper or paper towel.
- Brush off rear truck and its swivel linkage.
- Relubricate front and rear truck axles and swivel linkage. Use straight SAC - 40 weight oil.
- Lightly spray running gear with WO-40 and wipe excess off with a paper towel to remove cinder, ash and ballast dust
- Relubricate entire running gear. Use straight SAE - 40 weight oil.
- Replace grate/ash pan.

In situations where your running time has not exceeded 2 hours, and you will be running the locomotive again in less than 24 hours, the above cleaning will suffice .

### AFTER 3 TO 4 HOURS OF ACCUMULATED RUNNING TIME

- Remove grate/ash pan
- Place engine on table so that front truck and rear truck are on newspaper or paper towel. Remove smoke box front. Unscrew two 1.6mm hex bolt on either sides of the smoke box.
- Use the flue brush to thoroughly brush out the tubes and flue, only when completely cooled down.
- Use computer vacuum to remove accumulated cinders from smoke box.
- Use toothbrush to thoroughly brush inside of smoke box and its pipe work; vacuum again. With rear truck overhanging table edge, use toothbrush to brush out the firebox sides, front and back. Brush off rear truck and its swivel linkage.
- Using "Stoddard" solvent in a sprayer, thoroughly wash out smoke box, smoke box front, engine, running gear, and firebox.
- Wipe off residue with paper towels and let engine air dry for a while .
- Lightly spray running gear only, with WD-40 and wipe excess off with a paper towel.
- Reassemble smoke box, replace grate/ash pan .
- Re-lubricate entire engine. Use straight SAE - 40 weight oil.
- After re-lubricating, wipe the engine and tender with a paper towel dampened with Lemon Pledge, or similar furniture polish.



The above level of cleaning should be performed after all runs of more than 3 hours, or when accumulated running time exceeds 3 hours,

### Placing Your Locomotive In Storage

#### Short Term Storage ••••• More Than 24 Hours, Less Than 60 Days

- Follow the steps for cleaning the engine listed above in "AFTER 3 TO 4 HOURS OF RUNNING."
- If the engine will be fired again within 60 days, you may leave the boiler with water at or above the bottom nut on the gauge glass.
- Store engine and tender in a dry environment. Do not wrap in plastic; condensation can form with temperature changes and the moisture cannot evaporate.

#### Long Term Storage ••••••• More Than 60 Days

- Follow the steps for cleaning the engine listed above in "AFTER 3 TO 4 HOURS OF RUNNING."
- Drain boiler

Place a length of large model airplane fuel line on both the gauge glass and boiler blow down pipes. Unscrew Goodall Valve from boiler.

Open both boiler and gauge glass blow downs and let boiler drain out. When empty, close valves and replace Goodall Valve.

- Store engine and tender in a dry environment. Do not wrap in plastic; condensation can form with temperature changes and the moisture cannot evaporate.

### Maintaining your Coal Fired C-25

The amount of maintenance your locomotive needs will be directly related to how well you lubricate, clean and care for it. It should need relatively little maintenance, other than keeping the pipe work tight, and occasionally adjusting the axle pump gland. All of this maintenance can be done with a nominal selection of wrenches.

#### Tools You Will Need

The boiler and its fittings use standard inch sized wrenches. You will also need an allen wrench that accommodates the 2 mm stainless steel socket headed cap screws, although we provide one for your use, replacements can also be purchased at hardware stores.

The wrench set best suited for maintaining your locomotive boiler and piping is:

Craftsman 10 pc. Wrench Set, Standard Combination Ignition Sears item #00942319000 Mfr. model #42319



**C-25 COAL FIRING CHECK LIST  
AND QUICK REFERENCE**

1. Unpack Tender

- Lubricate Tender
  - Use straight SAE - 40 weight oil.
  - Journals and bolsters
- Place Tender on Track

2. Unpack Locomotive

- Lubricate Locomotive
  - Use straight SAE - 40 weight oil.
  - Axle Pump
  - Truck Swivel Points
- Left Side
  - Trucks and Driver Axles
  - Side Rods and Connecting Rod Crank Pin
  - Cross Head and Connecting Rod Pin
  - Valve Gear and Valve Guide
- Right Side
  - Trucks and Driver Axles
  - Side Rods and Connecting Rod Crank Pin
  - Cross Head and Connecting Rod Pin
  - Valve Gear and Valve Guide
  - Reverse Rod
- Check That Grates are Clean and Installed

3. Place Locomotive on Track and Prep

- Check That Smoke box is Clean
- Close Door

- Drain and fill Lubricator as needed.
  - Couple to Tender
  - Draw Bar
  - Bypass Return
  - Pump Feed

- Fill Tender Tank
  - Approximately 2 Quarts of Water

**\*\*\* USE ONLY DISTILLED WATER - DO NOT USE WATER THAT HAS BEEN DEIONIZED. \*\*\***

Water that has been OZONATED or distilled by reverse osmosis is acceptable, but it is best to use water that has been Steam Distilled without further processing.

- Fill Boiler • If Needed

- Water Level 1/2 to 3/4 of water gauge

Purge Air from Pumps

- Open Bypass Valve and Pump Tender Pump 15 Strokes.
- Close Bypass Valve and Pump Tender Pump 5 Strokes .

LEAVE BYPASS CLOSED



Close Blower Valve

#### 4. Prepare Coal Supply

Fill Firing Car with Coal  
Shovel  
Rake / Pick

#### 5. Begin Firing Process

Place Suction Fan in Smokestack

Leave Switch Off

Stoke Firebox with Charcoal Soaked in Lamp Oil.

Fill level with bottom of firebox door.

Light Charcoal

Simultaneously Turn On Fan.

Close firebox Door.

When Steam Pressure Reaches 10 lbs. Turn Off and Remove Fan.

Turn On Blower.

Add 2 to 3 Scoops of Coal.

When pressure reaches 30 Lbs, add coal. Fill level with bottom of Door. Use pick to spread the coal evenly throughout firebox. Reduce blower slightly to compensate for increased pressure.

When Pressure Reaches 70 Lbs. Start Engine

Check Coal Level• Add level with bottom of door if needed.

Open Cylinder Drains.

Check that Bypass Valve is Closed.

Place Johnson Bar in Forward.

Open Throttle 112 to 3/4 Turn.

Assist Locomotive if needed.

After traveling 15 to 20 feet close cylinder drains and adjust throttle.

Throttle opening approximately 1/4 turn.

After traveling approximately 100 feet add coal until level with bottom of firebox door.

#### 6. Continuous Running Procedures

##### WATER

Closely Monitor Water Level.

If level is Above, At or Close to the Top of Glass, OPEN BYPASS VALVE.

If level is at or approaching bottom nut. CLOSE BYPASS

VALVE. IF WATER IS BELOW WATER GAUGE NUT

IMMEDIATELY STOP LOCOMOTIVE MAKE SURE BLOWER IS OFF

OPEN FIREBOX DOOR

USE TENDER PUMP TO ADD WATER TO BRING WATER LEVEL UP.

NOTE: Goodall Valve and pump bottle can also be used to add water.

When water level is restored turn on blower, close door and commence running locomotive.

##### COAL

Approximately every 4 to 5 minutes when using Welsh Coal from Coles', check condition of fire.

Coal from Coles' burns fairly fast. Other coal may burn slower.

A strong bed of embers needs to be maintained, and coal should be added as necessary.

The intensity of the fire can be watched through the 2 holes in the door.

Adjusting the Fire.



Pressure dropping below 55 lbs, turn on the blower valve.  
Safety continuously blowing off, close blower valve, if open, and open firebox door.  
When running very slowly with light load it may be necessary to crack blower valve.

### I Left Fire Die Down Too Low.

Add 1 shovel of coal, turn on blower - wait for fire to build.  
As fire builds, slowly add more shovels of coal to renew bed of embers.

### The fire went out.

If the dead bed of coal is not too deep, add several scoops of charcoal. Place fan in stack, relight charcoal, turn fan on.  
As fire builds, add Coal.  
When pressure reaches 10 to 15 lbs, remove fan and turn on blower.

If heavy bed of coal, dump grates and start over from scratch with charcoal.  
You should be able to reuse the unburned coal that was dumped.

## 7. Ending Your Run

Cease adding coal and let the fire burn out while the engine continues to run.

When pressure drops to about 45 lbs. Run engine onto cooling track.  
Close throttle, close lubricator valve, close blower valve. Open firebox door. Open gauge glass drain for a few moments to flush out glass, close drain.

Water level may be left at or slightly above the red line during short term storage

As soon as fire is totally out, no visible embers, open blower to release boiler pressure, disconnect tender pump feed and bypass return line.

When engine is cool, close blower valve.

Brush cinders from engine and tender with soft 1 1/2 inch paint brush. Drain all water from tender by turning upside down.

Place engine so that rear truck overhangs a table edge or track decking.

With wastebasket or open ground under overhanging portion of engine, pull grate / ash pan pin, remove and empty .

Brush off any unburned coal. ash and cinders from rear truck and its swivel linkage. ( Old toothbrush works wen. ) Brush off grate / ash pan and replace on engine.

Drain water from lubricator and refill level with the bottom of cross the tube. Consumption should average about 1 to 1 and 1/2 cc per hour of running time.

## 8. After Run Servicing

### AFTER EACH RUN

Remove grate / ash pan

Place engine on table so that front truck and rear truck are on newspaper or paper towel.

With rear truck overhanging table edge, use toothbrush to brush out firebox sides, front and back.

Brush off rear truck and its swivel linkage.

Re-lubricate front and rear truck axles and swivel linkage. Use straight SAE - 40 weight oil. Lightly spray running gear with WD-40 and wipe excess off with a paper towel. Re-lubricate entire running gear. Use straight SAE - 40 weight oil.

Replace grate/ash pan

### AFTER 3 TO 4 HOURS OF RUNNING

Remove grate I ash pan



Place engine on table so that front truck and rear truck are on newspaper or paper towel. Remove smoke box front. Two 1.6mm hex bolts at either side of smoke box.  
Use the flue brush to thoroughly brush out the lubes and flue.  
Use computer vacuum to remove accumulated cinders from Smoke box.  
Use toothbrush to thoroughly brush inside of smoke box and its pipe work; vacuum again . With rear truck overhanging table edge, use toothbrush to brush out firebox sides, front and back.  
Brush off rear truck and its swivel linkage.  
Using "Stoddard" solvent in a sprayer, thoroughly wash out smoke box, smoke box front, engine and running gear, and firebox.  
Wipe off residue with paper towels and let engine air dry for a while.  
Lightly spray running gear with WD-40 and wipe excess off with a paper towel. Reassemble smoke box, replace grate / ash pan .  
Re-lubricate entire engine. Use straight SAE - 40 weight oil.  
After re-lubricating, wipe the engine and tender with a paper towel dampened with Lemon Pledge, or similar furniture polish.

### 9. Short Term Storage

Follow the steps for cleaning the engine listed above in "AFTER 3 TO 4 HOURS OF RUNNING."  
If the engine will be fired again within 60 days, you may leave the boiler with water at or above the bottom nut on the gauge glass.

Store engine and tender in a dry environment. Do not wrap in plastic; condensation can form with temperature changes and the moisture cannot evaporate.

### 10. Long Term Storage

Follow the steps for cleaning the engine listed above in "AFTER 3 TO 4 HOURS OF RUNNING."

Drain boiler

Place a length of large model airplane fuel line on both the gauge glass and boiler blow down pipes.

Unscrew Goodall Valve from boiler.

Open both boiler and gauge glass blow downs and let water drain out. When empty, close valves and replace Goodall Valve.

Store engine and tender in a dry environment. Do not wrap in plastic; condensation can form with temperature changes and the moisture cannot evaporate.

## ACCUCRAFT C-25

### Control Layout

Control layout is shown below with the cab removed to provide clarity. All controls are readily accessible from the rear of the cab with the tender connected, and the Throttle, Blower Valve and Axle Pump Bypass Valves all project outside of the cab within easy reach.

The Firebox Door is easily opened using the corner of the shovel or the hook end of the Fire Pick. The door has two small air holes in it that allow the operator to see the intensity of the fire.

The water gauge and pressure gauge are easily visible through the left side window.

