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**ACCUCRAFT TRAINS**

33268 Central Avenue

Union City, CA 94587

Tel: (510) 324-3399

Fax: (510)

324-3366

Info@accucraft.com



**D&RGW K-27 2-8-2 #463**

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## Instruction Manual - D&RGW K-27 Live Steam



### Introduction

This locomotive is a model of a K-27, one of fifteen ordered by the Denver & Rio Grande Western Railroad in 1902 and delivered in 1903. The Rio Grande numbered them N° 450 through N° 464. The “K” designation was the Rio Grande’s code for a Mikado, or 2-8-2. The “27” referred to the locomotive’s tractive effort, in this case 27,000 pounds. Only two K-27s remain today, one in Michigan, running on the Huckleberry Railroad, and one running on the famous Cumbres & Toltec line in Northern New Mexico/Southern Colorado.

Operating a model live-steam locomotive is much different from running an electrically powered engine. It is a more hands-on, interactive experience. The locomotive must be periodically fueled, oiled, and watered. As supplied, the K-27 is manually controlled, which means that you must actually drive the locomotive using the controls in the cab, just as you would a full-size engine.

The performance of the engine is also unlike electric locomotives. The K-27 should pull a dozen or more standard-size freight cars on good, level track. Grades and sharp curves will diminish its capability. A good engineer will learn the engine’s characteristics and idiosyncrasies over time, to get the best performance and longest duration from it.

### Safety

For your safety, there are certain rules that should be observed, as follows:

1. The safety valve is under the steam dome. It has been set at the factory to release at around 75 pounds per square inch of pressure. Never tamper with the safety valve.
2. The firing system has been designed to use butane gas only. Do not use any other gas (including propane or butane/propane mix), as the storage pressures can reach unsafe levels.
3. Always refuel the engine well away from other working live-steam locomotives. The fuel filling system allows a small amount of the gas to bleed off as the fuel tank is being filled. A passing engine can ignite this bleed-off gas, causing a potentially hazardous situation.
4. When lighting up, light your match first, then turn on the gas.
5. A steam engine gets hot. Be careful.

### Carrying the engine

The locomotive and tender should always be carried separately because of their weight. We suggest carrying the locomotive to the track by supporting it underneath the wheels with both hands, as opposed to lifting it by the pilot (which may not stand the stress) and rear beam. For general carrying, the engine can be carried on a carrying tray with handles.

### Preparing the engine

A steam-locomotive engineer goes through a lighting-up ritual every time his engine is to



Carrying

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be run. It is a good idea to follow the same routine each time so that nothing is overlooked.

1. Oil all external moving parts of the engine and tender with a high grade, lightweight machine oil like 3-in-1. Don't forget the wheel bearings in the pilot and trailing trucks, as well as those in the tender. Don't over-oil—a tiny drop will do the job.
2. Place the engine and tender on the track and couple them together. The drawbar between the units has two holes. For tighter curves, use the rear hole. For wide-radius curves, the engine and tender can be coupled more closely together, using the front hole. Insert the twin gas jets (at the end of the hose coming from the tender) into the backs of the burners, making sure they seat snugly.
3. Remove the cab roof by sliding it backward. The displacement lubricator is on the footplate at the left side of the cab. This lubricator ensures the cylinders and valves are properly lubricated inside. As the steam passes through it, a small amount will condense into water. This water will sink to the bottom of the lubricator, forcing a similar quantity of oil into the steam line and thus to the cylinders. The lubricator has a drain valve under the cab. Open the valve (no need to remove it entirely) and remove the lubricator's cap. Any water remaining in the lubricator should drain out the valve. When the water stops draining, or oil starts coming out, close the valve. Fill the lubricator to the top with proper steam cylinder oil and replace the cap.
4. Unscrew the filler plug, which is at the top of the steam turret (atop the boiler, inside the

**Filler plug**

**Pressure gauge**

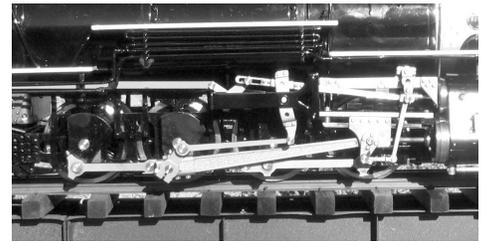
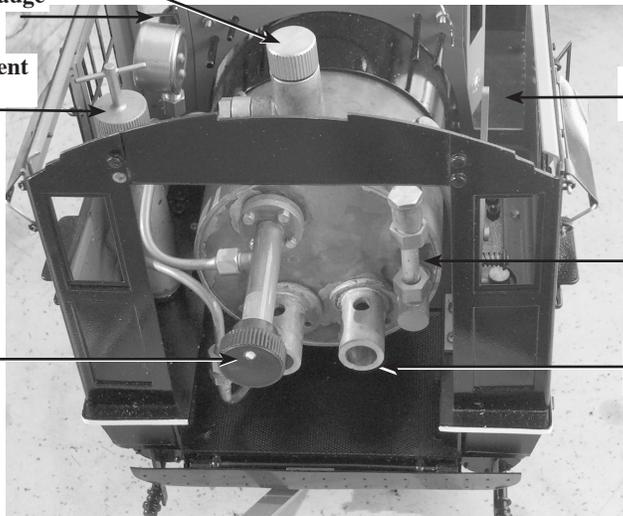
**Displacement lubricator**

**Throttle**

**Reversing lever**

**Water glass**

**Burners**



**Make sure all moving parts of the valve gear are oiled before each run.**

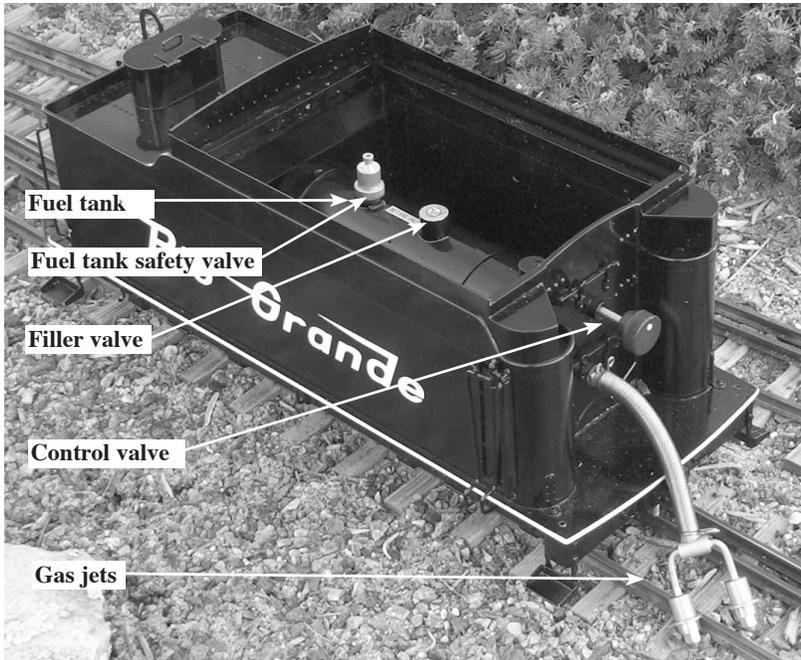


**Lubricator drain**

cab) and fill the boiler with water. The water level will show in the sight glass on the boiler's backhead. Fill the boiler until the water reaches the top of the glass. This is a BIG locomotive and it will take a lot of water (approximately 660 ml.). Do not overfill the boiler—there needs to be room above the water for steam to form. Use only distilled water in your engine's boiler. Tap water contains minerals that will leach out, cloud the water glass, and ultimately affect the performance of the engine.

5. Finally, add fuel. Your K-27 burns butane gas. The gas tank is located in the tender beneath the dummy coal load. Remove the coal load with the ring provided. Butane gas can be purchased at the grocery store or at a tobacconist's as cigarette-lighter refills. These come with a nipple suitable for the filler valve on the K-27's gas tank. (Butane can also be purchased more economically in larger containers at camping-supply stores, but these cans will require a special adapter for filling the engine's tank.) Simply press the nozzle of the butane canister hard onto the filler valve atop the tank, making sure that the control valve is closed. You will hear the gas transferring and will see a little gas bleeding out of the

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valve. The gas may tend to sputter a little from time to time while filling. When the tank is full, the gas will begin to splutter a lot and much more gas will escape the valve. When the gas tank is full you are ready to fire up the engine. NOTE: Because of the size of this locomotive and the fact that it has two burners, a very large gas tank has been provided, which takes a while to fill completely. If you find that you are getting relatively short runs and there is still a lot of water left in the boiler, chances are that you didn't fill the gas tank all the way.

### Firing up

The engine's burners reside at the back of the flues inside the boiler. Open the hinged smokebox door at the front of the engine and you'll be able to see both flues. To light up, strike a match and hold it at the open smokebox door while simultaneously opening the gas valve in the tender very slowly until the gas ignites. You should hear the gas coming into the burner. Opening the valve too wide or too fast may blow out the flame or cause the fire to burn in the smokebox.

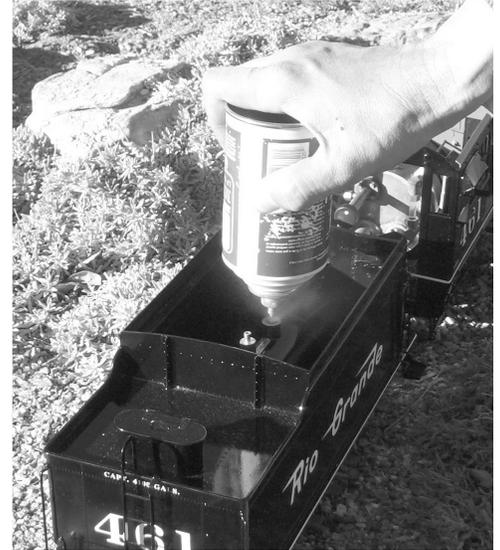
The fire should flash back into the back of the flues with a quiet "pop." If it wants to burn in the smokebox or in the forward part of the flues, slowly close the gas valve until it flashes back to the burner. Don't let the fire burn in the smokebox—your engine will not run as it should and may be damaged. The fire should burn in crescent-shaped flames that should be clearly visible through the smokebox door. The flames should be bright blue and should burn steadily. If they sputter or look yellow or green, adjust the gas valve accordingly. The object is to run the burner at the lowest setting possible to operate the engine, thereby increasing the efficiency of the engine and the duration of the run. You'll get the hang of this with practice.

Make certain that both burners have ignited by looking down the flues at the fires. If only one burner is lit, simply strike another match and put the flame in the smokebox. This should ignite the second burner. If a burner goes out while the engine is in operation (you might be able to tell by the sound of the fire or by sluggish performance) it must be manually relit. One burner will not automatically ignite the other.

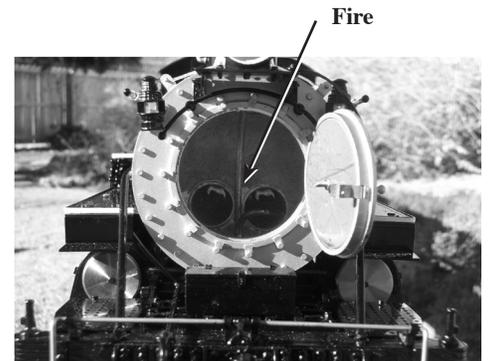
After ten or twelve minutes, pressure on the pressure gauge should read about 20psi (pounds per square inch) or so. The safety valve is set at 75 psi. When the pressure on the gauge reaches 50psi, the engine can be run.

### Drain cocks

Unlike most small scale, live-steam locomotives, your K-27 is fitted with working drain cocks on the cylinders. When first starting out, the cocks should be open (levers moved to



Filling the gas tank



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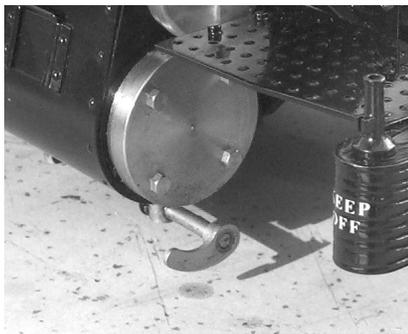


“outside” positions). This will allow water in the cylinders to drain while the cylinders heat up to working temperature. As steam enters cold cylinders, it condenses, so expect a fair amount of water to come out at the beginning of each run. Once the cylinders have warmed up, you can close the drain cocks, if you wish. However, because the holes in the drains are so small, the engine can be run with them wide open if you like the steam effects. To close them, move the levers to the “up” position.

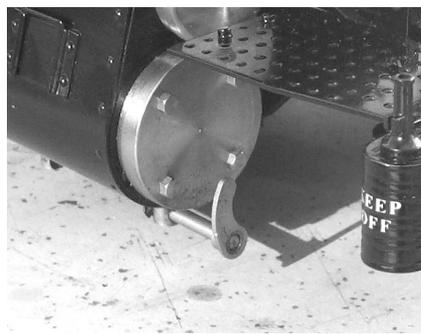
### Running

Move the reversing lever at the right side of the cab to the forward position. With the engine on the track, and without a train, open the throttle. The engine may need to be pushed a little to overcome the steam condensing into water in the cold cylinders, but the open drain cocks will minimize this. After a few moments, the engine should take off on its own, moving away smoothly.

Once the engine is running smoothly, a train can be coupled on and the run can proceed. Since all of the locomotive’s functions are controlled from the cab, it can be driven like a full-size engine, meaning that you’ll have to stay with the engine through the run if you want to



**Drain cocks open**



**Drain cocks closed**

change its speed or direction. If you have a suitable track, the engine can be left to run on its own at a steady speed. Keep your eye on the water glass. When the water level reaches the bottom of the glass, shut the engine down and repeat the firing up process. With practice and good weather, steady runs of an hour or more are not uncommon for this engine.

### Shutting down

To shut the engine down, simply close the gas valve and allow the engine to run off any residual steam. At the end of the run, open the blowdown valve and leave it open. This will relieve the boiler of what little pressure remains and prevent a vacuum from forming inside that could draw lubricating oil into the boiler if the throttle valve is not fully closed. Because of the size of this engine, blowing down could take several minutes.

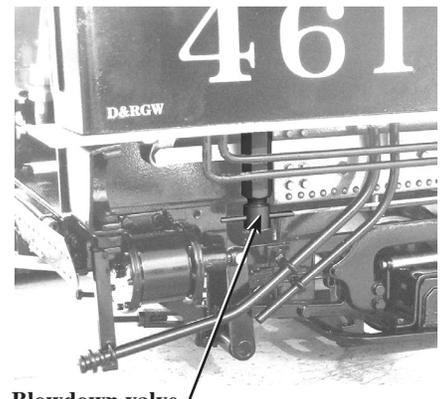
After a day’s operation in the garden, you’ll probably find that your engine has a coating of oil all over it. This is steam-cylinder oil that has been exhausted from the stack. A simple wipe down with a dry cloth is all that’s necessary to restore the engine to pristine condition. This is best done while the engine is still warm. Wipe any grit and excess oil from the wheels and running gear.

The boiler can be drained of water, or not, as you wish. Leaving water in the boiler will not harm it. The lubricator can also be drained and refilled with steam oil in preparation for the next run.

### Cold-weather running

The weather can dramatically affect the performance of your locomotive. Cold and wind can decrease efficiency to a disappointing level. Butane gas becomes liquid at 32°F and will not work. As it approaches 32°, its pressure (and effectiveness) diminishes.

The compartment in the tender in which the gas tank resides can be filled with warm water in cooler weather. This will warm the gas in the tank and keep its pressure up, which will cause



**Blowdown valve**

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the engine to operate in a much more lively manner, much as it does in warm weather. If the water in the tank cools, just replace it with warmer water. Empty the tender at the end of the day's run. **Note:** the temperature of the fuel-supply-can must always be higher than that of the engine's gas tank. If you have warmed the engine's tank and the supply tank is cooler, gas will not transfer.

### Notes on radio control

Although the K-27 was designed as a manually controlled locomotive, there is no reason why radio control (R/C) cannot be fitted, with some ingenuity. A two-channel radio is all that's necessary, one for the throttle and one for the reversing lever. The gas valve should always be controlled manually. The reversing lever will have to be modified so that it does not lock in position, but it must still have stops at either end of its throw for proper positioning of the reversing gear.

### Specifications

**Scale:** 1:20.3 (15mm = 1'0")

**Gauge:** N° 1 (45mm)

**Wheel arrangement:** 2-8-2

**Boiler:** Double flue, gas fired, silver-soldered copper, blow-off pressure, 75 psi

**Boiler fittings:** Safety valve, throttle, blowdown valve, water glass, pressure gauge

**Fuel:** Butane gas

**Cylinder lubrication:** Displacement lubricator in left side of cab

**Cylinders:** Fixed cylinders, D-valves, exhaust through the stack

**Valve gear:** Modified Walschaerts, controlled from the cab

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