HISTORY OF THE STEAM LOCOMOTIVES

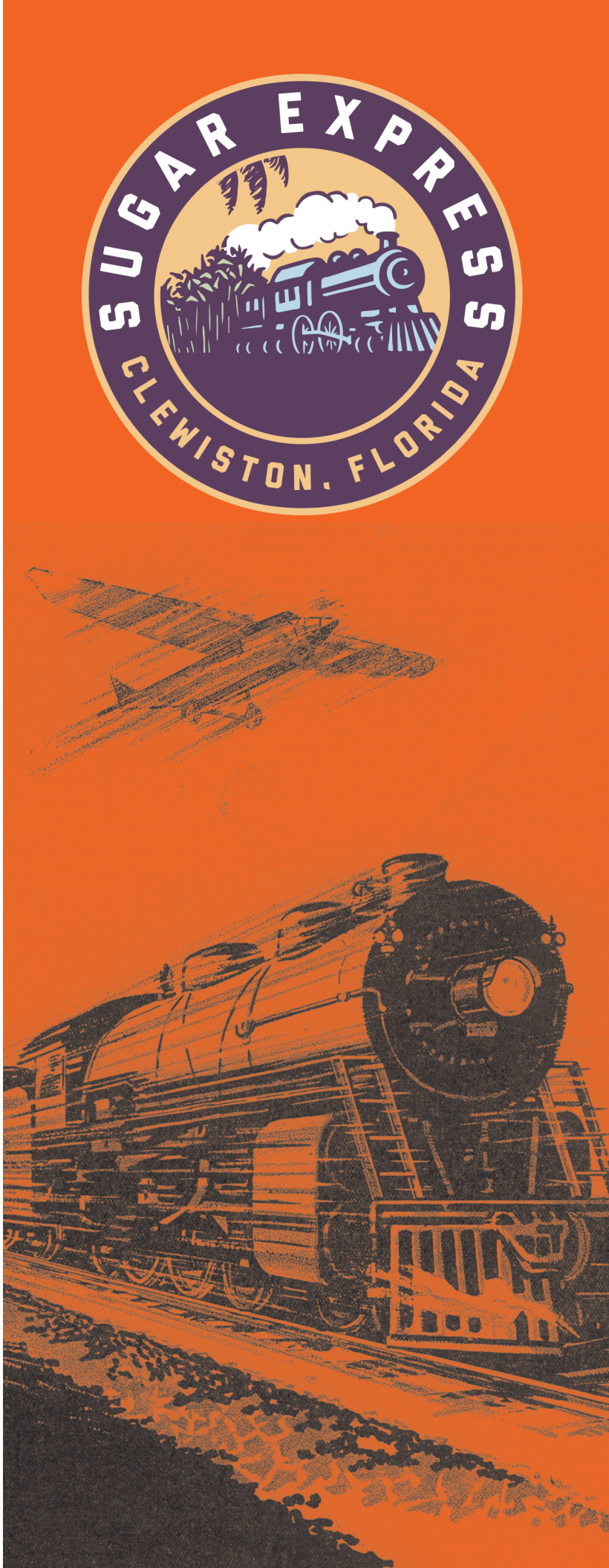
The steam engine was invented in the late 1700s as part of the foundation of the Industrial Revolution. The first steam locomotive was developed in the early 1800s and was first used to replace horses carrying goods on tramways. Over the past 200 years, the principle of how a steam engine works has remained the same.

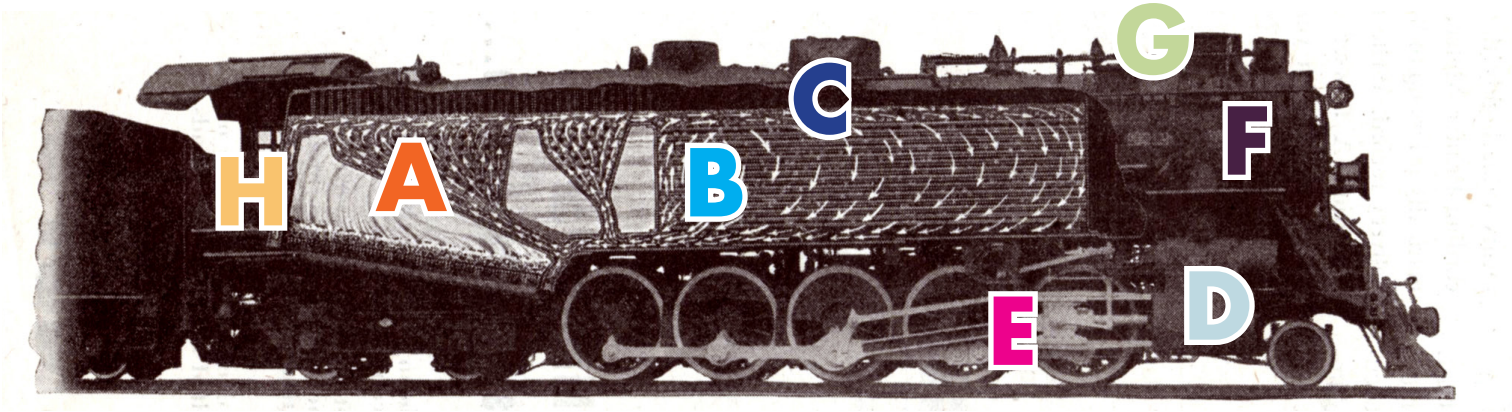
No. 148 is a 4-6-2 Pacific–type steam engine built by the American Locomotive Works in Richmond, Virginia. The Pacific-type, useful for freight and passenger service, has a four-wheeled front truck, three pairs of driving wheels and a two-wheeled "trailing" truck.

HOW DOES A STEAM LOCOMOTIVE WORK?

A steam engine requires a combustible fuel and a supply of water. On most steam locomotives, the fuel and water are carried in a separate car, the tender behind the locomotive. No. 148's tender carries 7,300 gallons of water and 3,500 gallons of recycled vegetable oil for fuel to heat the water to create steam. Using vegetable oil minimizes our impact on the environment.

The cylinder valve controls the steam flow into and out of the cylinders. The steam exhausts under a great deal of pressure and makes the familiar "chuff" sound associated with steam engines. As the engine gains speed, the "chuff" sound repeats faster and faster.





A. **FIREBOX** This is where the fuel is burned to create heat.

B. **BOILER** 148 uses a fire tube boiler. Hot gases produced in the firebox are pulled through a rack of tubes in the boiler. The tubes heat the water that surrounds them to produce steam. The steam collects in the steam dome on the top of the boiler.

C. **STEAM DOME** Inside the steam dome sits the throttle valve. The throttle valve is attached to the throttle handle in the cab. The engineer uses the throttle to control the quantity of steam delivered to the cylinders. The safety valve, located behind the steam dome, opens to release steam when the pressure becomes too high.

D. **VALVES, CYLINDERS, AND PISTONS** The steam is converted to mechanical energy in the cylinders. Steam under pressure is passed through cylinder valves into a chamber and drives the piston. This achieves twice the power by alternately introducing steam on either side of the piston so the piston rod is both pushed and pulled, generating power on both strokes.

E. **RODS** The piston is aligned in the cylinder by a crosshead running on a guide. The crosshead carries the small end of the connecting rod. The other end, the big end, transmits the power to the wheels with the crank pin. No. 148, like most locomotives, has more than one set of driving wheels to share the power generated by the double-action cylinders. Cranks on either side of the locomotive are offset by 90° to spread the power over a complete revolution of the wheels.

F. **SMOKEBOX** Spent steam is released from the cylinders through the blast pipe below the stack. This arrangement produces a reduction in pressure in the smokebox which draws the firebox gases through the boiler tubes. The harder the locomotive works, the more gas is drawn through the tubes, generating more steam.

G. **THE STACK** The spent steam from the blast pipe mixes with the gases from the boiler tubes and exits through the stack. The harder the locomotive works, the more gases and steam comes out the stack.

H. **CAB** The train crew operates the engine from the cab. The fireman's job is to make the steam by controlling the fire in the firebox and the water supply to the boiler. The engineer uses the steam by operating the throttle and monitors the steam pressure, fuel, and water.