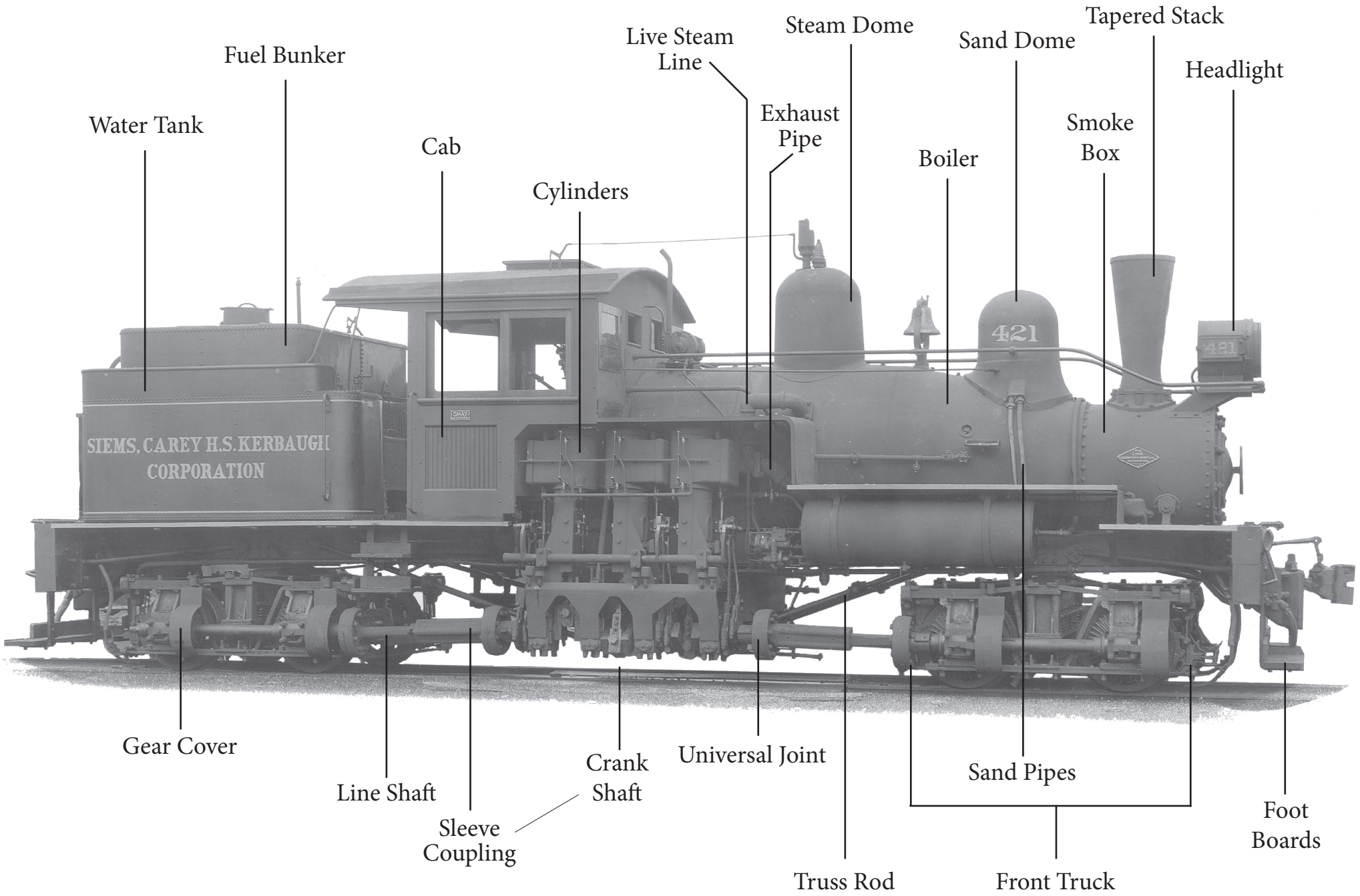

Water Tank
Fuel Bunker
Cab
Live Steam Line
Cylinders
Exhaust Pipe
Steam Dome
Boiler
Sand Dome
Smoke Box
Tapered Stack
Headlight
SIEMS, CAREY H.S. KERBAUGH CORPORATION
421
Gear Cover
Line Shaft
Sleeve Coupling
Crank Shaft
Universal Joint
Truss Rod
Sand Pipes
Front Truck
Foot Boards

Water Tank
Stores water that is converted into steam to power the locomotive's engine.

Fuel Bunker
Holds the fuel (coal, wood, or oil) used to heat the boiler and generate steam.

Cab
The operator's compartment where the engineer and fireman control the locomotive.

Cylinders
Steam enters these chambers to push pistons that convert thermal energy into mechanical movement.

Live Steam Line
Carries high-pressure steam directly from the boiler to the engine's cylinders.

Exhaust Pipe
Vents spent steam from the cylinders into the smokestack, often aiding in draft.

Steam Dome
Collects the driest steam from the boiler to reduce water carryover before entering the engine.

Boiler
Heats water into steam using fuel combustion, serving as the locomotive's core power source.

Sand Dome
Stores dry sand that is released onto the rails to improve traction in slippery conditions.

Smoke Box
Collects smoke and exhaust gases from the firebox before channeling them out through the stack.

Tapered Stack
Directs smoke and exhaust upward while often incorporating a spark arrestor to reduce fire risk.

Headlight
Provides forward illumination for night or low-visibility operation and alerts oncoming traffic.

Gear Cover
Protects the exposed gears of the Shay's unique drive system from debris and weather.

Line Shaft
A central rotating shaft powered by the engine that transmits torque to the trucks via the bevel gearing.

Sleeve Coupling
A flexible connector that joins shaft segments, allowing for motion around tight curves and over uneven terrain.

Crank Shaft
Converts the pistons' linear motion into rotational motion to drive the locomotive.

Universal Joint
Allows torque to be transmitted through changing angles, crucial for articulation on curves.

Truss Rod
Strengthens the locomotive's frame and resists bending forces along its length.

Sand Pipes
Delivers sand from the dome to the rails directly in front of the wheels for added traction.

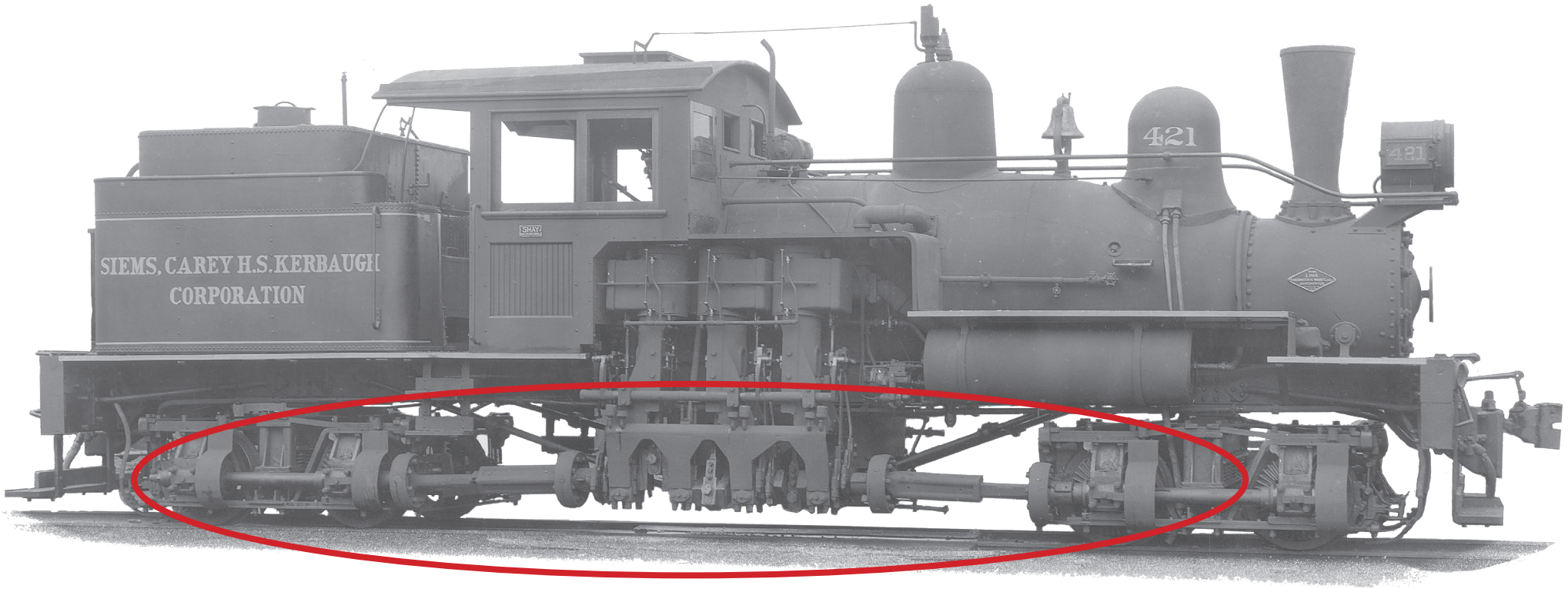
Trucks
A wheel assembly mounted under the front and rear of the locomotive that applies the locomotive power to the drive wheels on the rail. These trucks swivels to help navigate tight curves.

Foot Boards
Exterior platforms used by crew for the brakeman to ride on during switching moves and for mounting, dismounting, and safe footing during operation

Four Innovative Aspects of a Shay Locomotive

Central Driveshaft with Beveled Gears

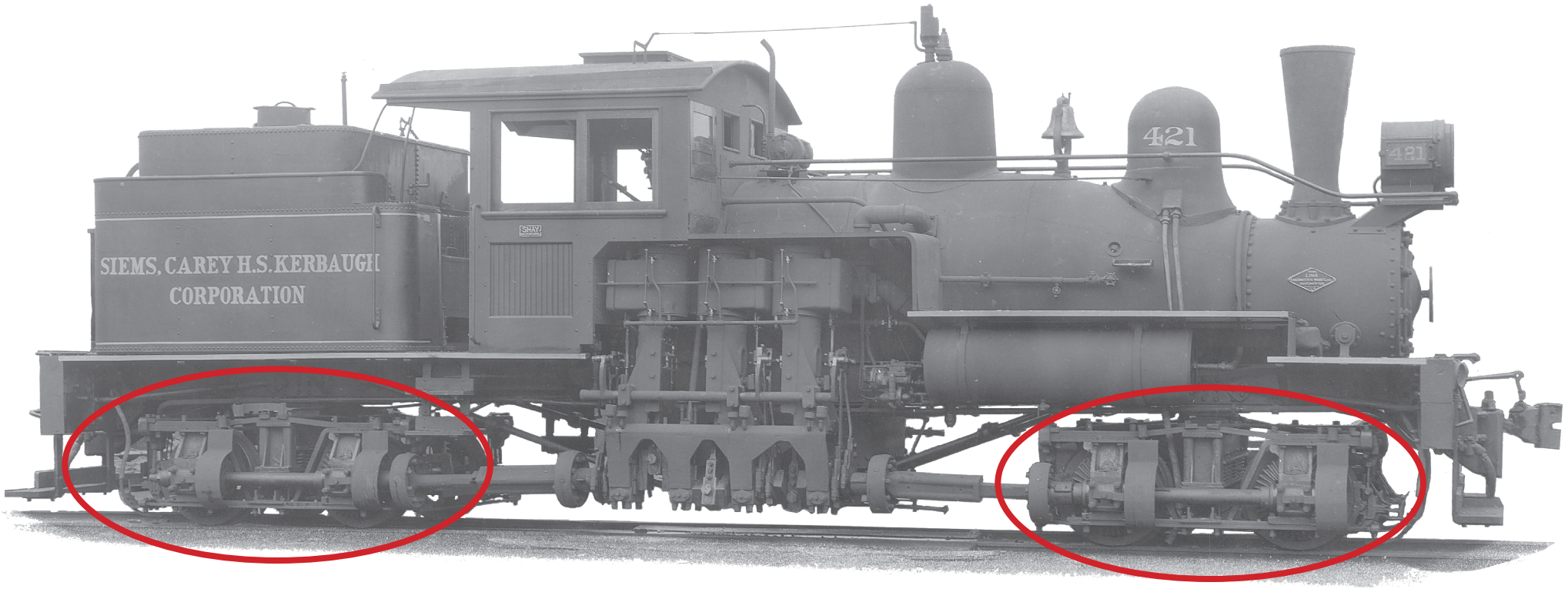
The Shay locomotive employed a horizontal crankshaft that transmitted power through line shafts. The line shafts were connected by universal joints to bevel gears on each axle. This resulted in power going evenly to each axle and to every wheel on the engine. This drive system provided the locomotive with tremendous pulling power and traction.



Four Innovative Aspects of a Shay Locomotive

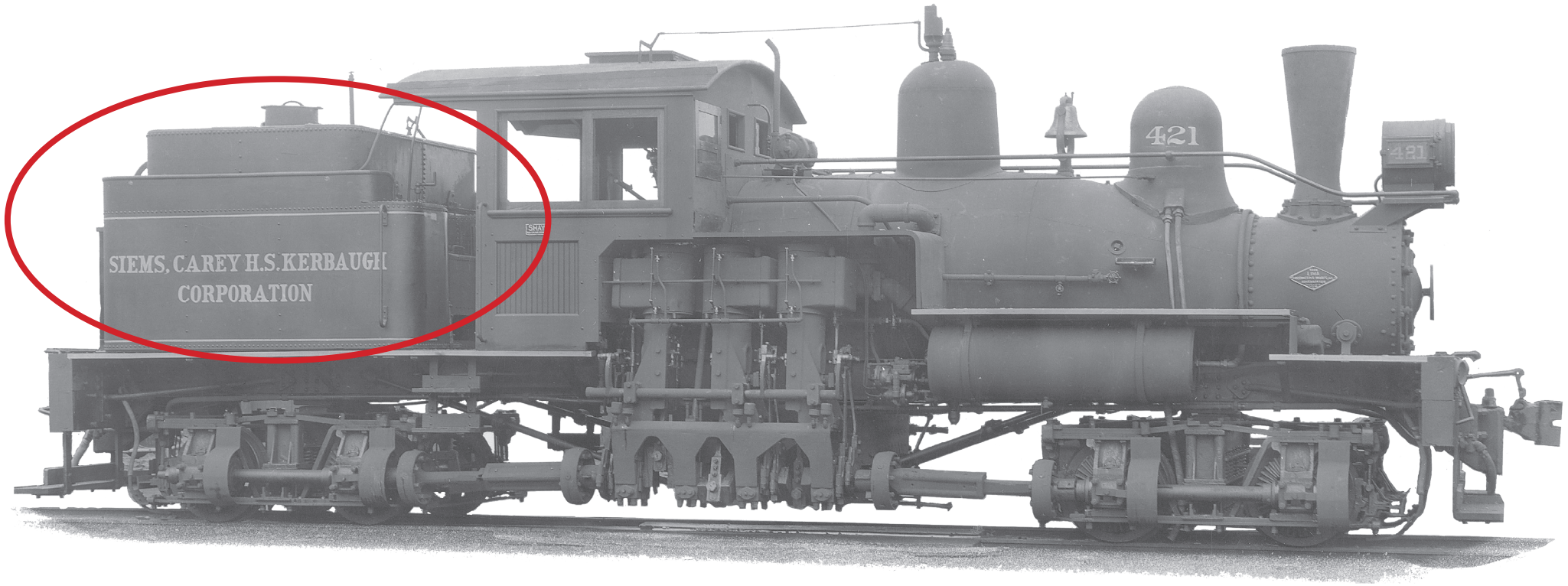
Pivoting Trucks with Slip Joints

Each set of 4 wheels—or "trucks"—was engineered to pivot independently from each other, thanks to universal joints and the slip jointed line shafts integrated into the drive system. This flexibility allowed the locomotive to handle the tight curves and uneven track which was common on logging railroads better than traditional locomotives with their rigid frames and rod-driven wheels.



Four Innovative Aspects of a Shay Locomotive

Placement of the Fueld and Water Tender Over Powered Wheels
Unlike conventional steam engines that towed a separate tender for fuel and water, the Shay placed its fuel and water directly above powered wheels. This increased the locomotive's tractive force, as the added weight directly enhanced grip on the rails—particularly useful on slippery or steep logging routes. On a Shay there was no dead weight; every pound of the engine and it's fuel and water were set over a drive wheel.



Four Innovative Aspects of a Shay Locomotive

Side-Mounted Engine for Easy Maintenance Access

The Shay Locomotive's steam engine and drive line were mounted on the engineer's side of the locomotive, rather than underneath the frame. This design gave engineers and firemen easy access for oiling, inspection, and repair, helping to minimize downtime and extend the operational lifespan of the locomotive. This is what gives a Shay its signature off center boiler.