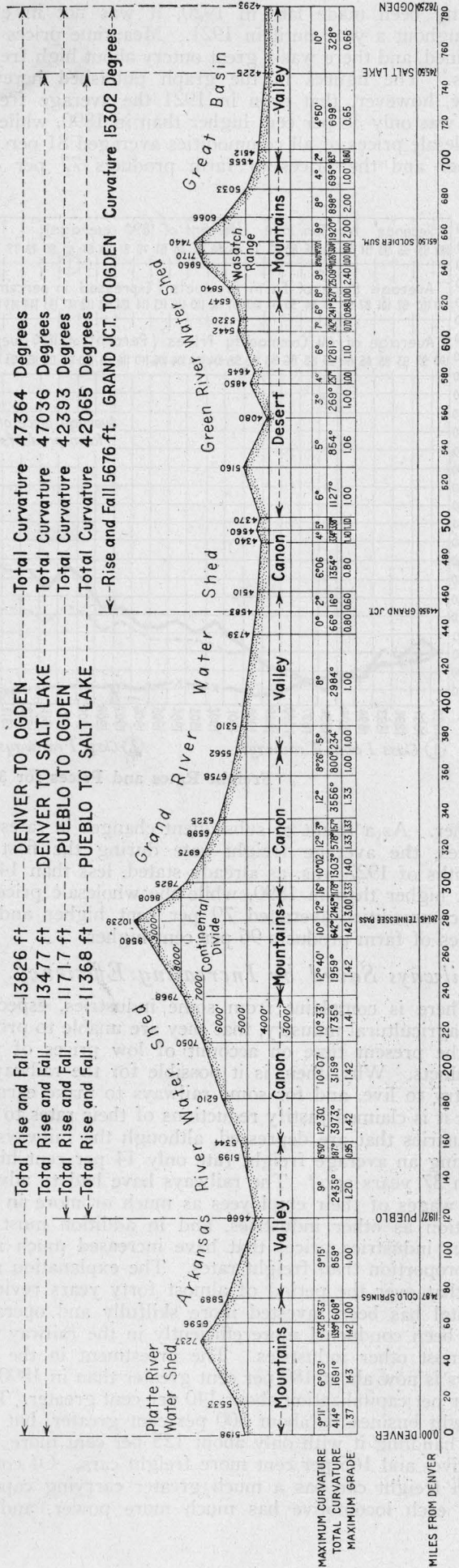


One of the 2-8-8-2 Type Locomotives Recently Delivered to the Denver & Rio Grande Western by the American Locomotive Company



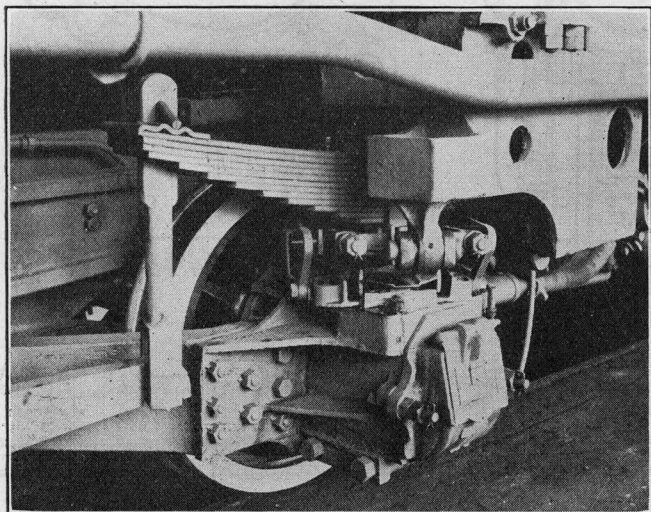
Condensed Profile of the D. & R. G. W. from Denver, Col., to Ogden, Utah

Ten 2-8-8-2 Type Locomotives for the D. & R. G. W.

Purchased primarily to reduce helper and light engine mileage—Maximum tractive force of 131,800 lb. at 70 per cent cut-off

THE Denver & Rio Grande Western recently received 10 four-cylinder simple articulated 2-8-8-2 type locomotives from the American Locomotive Company which represent the most recent effort to produce in a single traction unit the maximum power obtainable within the restrictions of rails, curves, grades and clearances. Permissible rail loads were relatively high and clearances relatively large so that it was possible for the designers to take complete advantage of these two important factors. As a result, a locomotive of abnormally large size was made possible for handling the desired tonnage over the ruling grade at the desired speed.

These locomotives develop a maximum tractive force of 131,800 lb. produced at 70 per cent cut-off, which is believed to be the largest power output of any coal-



The Trailer Truck

burning locomotive ever built. The cylinders are 26 in. in diameter by 32 in. stroke, and the boilers operate at a working pressure of 240 lb. per sq. in. The driving wheels are 63 in. in diameter. The eight pairs of coupled drivers carry a load of 559,500 lb. which gives a factor of adhesion of 4.2. These locomotives were designed to negotiate 22-deg. curves. The dimensions, weights and proportions of these locomotives are shown in the table.

This type of locomotive was selected because it was considered impossible to build a non-articulated locomotive that would handle the trains that the D. & R. G. W. desired to operate. Referring to the condensed profile, the locomotives are scheduled to handle 3,000 tons east from Grand Junction, Col., and as this constitutes a light load as far as Glenwood Springs, 89.47 miles, it is intended to run the engines at a speed of about 25 m.p.h. to that point. The grade changes at

Glenwood Springs and the speed will be reduced to about 15 m.p.h. as far as Minturn, which is 58.13 miles from Glenwood Springs. From Minturn to the continental Divide at Tennessee Pass, 20.51 miles, the loco-

Table of Dimensions, Weights and Proportions of the 2-8-8-2 Type D. & R. G. W. Locomotives

Railroad	D. & R. G. W.
Type of locomotive	2-8-8-2
Service	Freight
Cylinders, diameter and stroke	4—26 in. by 32 in.
Valve gear, type	Walschaert
Valves, piston type, size	14 in.
Maximum travel	7½ in.
Outside lap	1½ in.
Exhaust clearance	None
Lead in full gear	¾ in.
Cut-off in full gear, per cent.	70
Weights in working order:	
On drivers	559,500 lb.
On front truck	40,500 lb.
On trailing truck	49,000 lb.
Total engine	649,000 lb.
Tender	343,500 lb.
Wheel bases:	
Driving	33 ft. 6 in.
Rigid	16 ft. 9 in.
Total engine	62 ft. 10 in.
Total engine and tender	108 ft.
Wheels, diameter outside tires:	
Driving	63 in.
Front truck	33 in.
Trailing truck	42 in.
Journals, diameter and length:	
Driving, main	12 in. by 14¾ in.
Driving, others	11 in. by 14¾ in.
Front truck	6½ in. by 12 in.
Trailing truck	9 in. by 16 in.
Boiler:	
Type	Straight top
Steam pressure	240 lb. per sq. in.
Fuel, kind	Soft coal
Diameter, first ring, inside	100½ in.
Firebox, length and width	218 in. by 108 in.
Combustion chamber length	72½ in.
Tubes, number and diameter	284—2¼ in.
Flues, number and diameter	74—5½ in.
Length over tube sheets	24 ft.
Grate area	136.5 sq. ft.
Heating surfaces:	
Firebox and combustion chamber	560 sq. ft.
Arch tubes	45 sq. ft.
Syphons	110 sq. ft.
Tubes and flues	6,550 sq. ft.
Total evaporative	7,265 sq. ft.
Superheating	2,295 sq. ft.
Comb. evap. and superheating	9,560 sq. ft.
Tender:	
Water capacity	18,000 gal.
Fuel capacity	30 tons
Wheels, diameter outside tires	33 in.
Journals, diameter and length	6½ in. by 12 in.
General data, estimated:	
Rated tractive force at 70 per cent cut-off	131,800 lb.
Weight proportions:	
Weight on drivers ÷ total weight engine, per cent.	86.25
Weight on drivers ÷ tractive force	4.27
Total weight engine ÷ comb. heat. surface	67.8
Boiler proportions:	
Tractive force ÷ comb. heat. surface	13.78
Tractive force × dia. drivers ÷ comb. heat. surface	868
Firebox heat. surface ÷ grate area	4.1
Firebox heat. surface, per cent of evap. heat. surface	7.7
Superheat. surface, per cent of evap. heat. surface	31.6

motives will be operated in a three-engine train, being assisted by two smaller mallet type locomotives. The ruling grade between these two points is 3.33 per cent, with a maximum curvature of 16 deg. The locomotives will be run through alone with the train to Salida or Pueblo, 66.34 miles and 162.18 miles from Tennessee

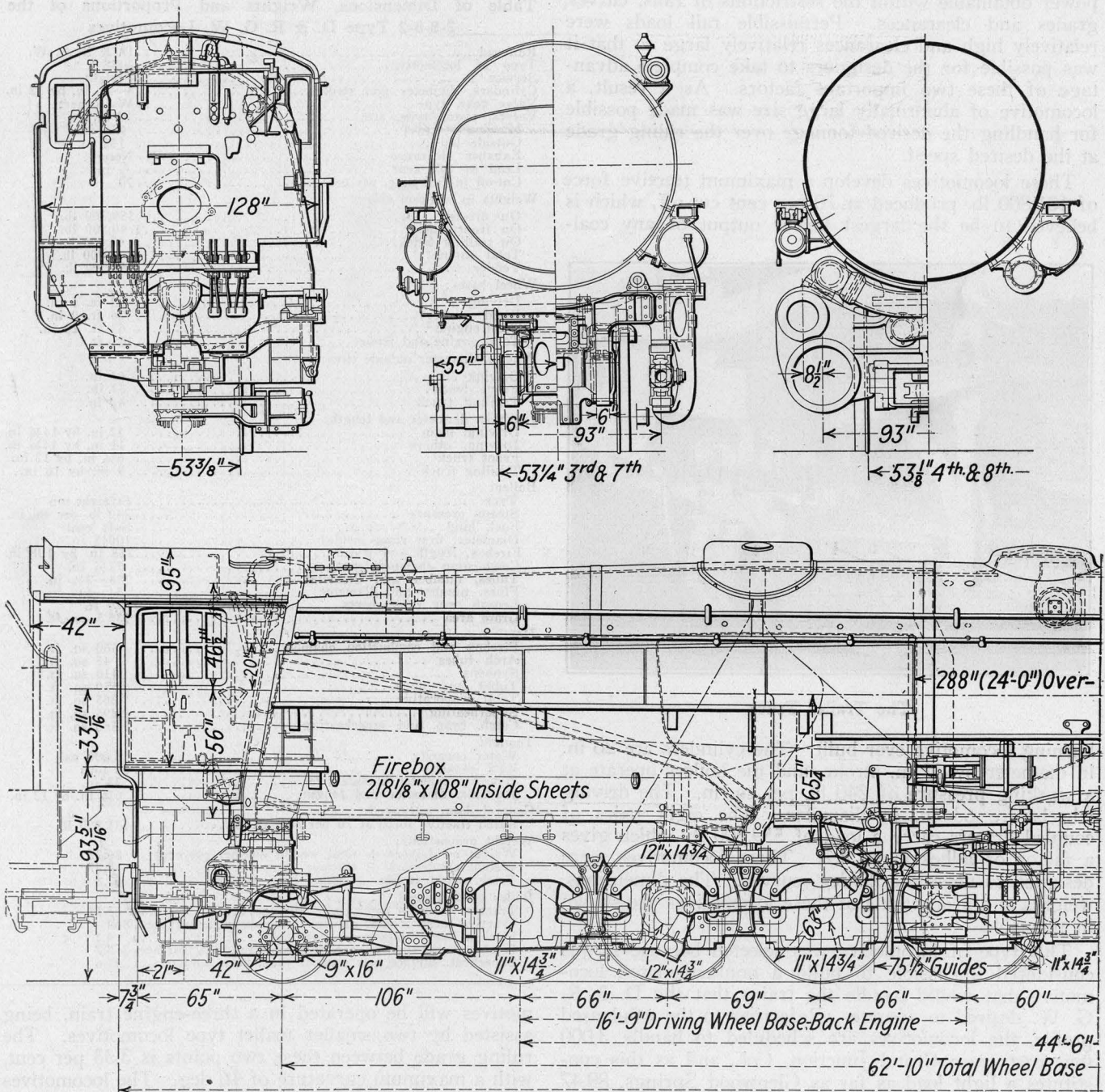
Pass, respectively. Westbound, out of Salida, the locomotives will be used on single-engine trains of 3,000 tons at a speed of about 16 to 17 m.p.h.

Boiler Has Unusually Large Firebox

To supply the steam to the four 26-in. by 32-in. cylinders, a straight top boiler having an inside diameter at the front of 100-15/16 in. and an outside diameter of 110 in. at the throat is provided. The barrel contains 284, 2 1/4-in. tubes and 74, 5 1/2-in. superheater flues, 24 ft. long. The firebox is believed to be the largest, both in grate area and heating surface, of any locomotive firebox ever built. It has a length of 218 in. and a width of 108 in., together with a combustion chamber 72 1/2 in. long, which gives a total evaporative heating surface of 560 sq. ft. The length of the grate is 182 in. giving a grate area of 136.5 sq. ft., with a Gaines arch located at the front end of the firebox. Two

Nicholson syphons are applied in each firebox, together with American arch brick, and a Type A superheater of 74 units is employed. Bituminous run of mine coal is fed to the grates by a Standard Type B stoker. The total evaporating surface of 7,265 sq. ft. is made up of 4,000 sq. ft. in the tubes, 2,550 sq. ft. in the flues, 560 sq. ft. in the firebox, 45 sq. ft. in the arch tubes, and 110 sq. ft. in the syphons. The superheating surface is 2,295 sq. ft.

A dry pipe of steel tubing 12-in. in diameter, conveys the steam from the dome to the superheater header containing the built-in American throttle which governs its supply to the cylinders. The steam pipes carrying 240 lb. pressure through swivel joints presented a new problem in ball joint packing design, but by the use of a special Johns-Manville packing and adjustable packing glands, perfectly steam-tight joints were obtained. The entire steam pipe arrangement always pre-



Elevation and Cross Sections of the 2-8-2 Type

sents considerable of a problem on an articulated locomotive, but it is believed this locomotive illustrates the simplest arrangement using the least amount of pipe that has yet been produced.

The header has the two regular equal size steam outlets connecting with curved steam pipes following the inside contour of the smokebox. The right-hand pipe projects through the smokebox wall below the running board and is turned to the rear by means of an elbow containing an expansion joint to lead the steam to the rear cylinders. It joins a cross-over pipe at a point just in front of the rear cylinder saddle which conveys the steam to each of the rear cylinders. The left-hand steam pipe in the smokebox terminates at its lower end in a ball joint packing gland, from which an S-shape connection provided with a slip joint, leads the steam to the cross-over pipe feeding the two front cylinders.

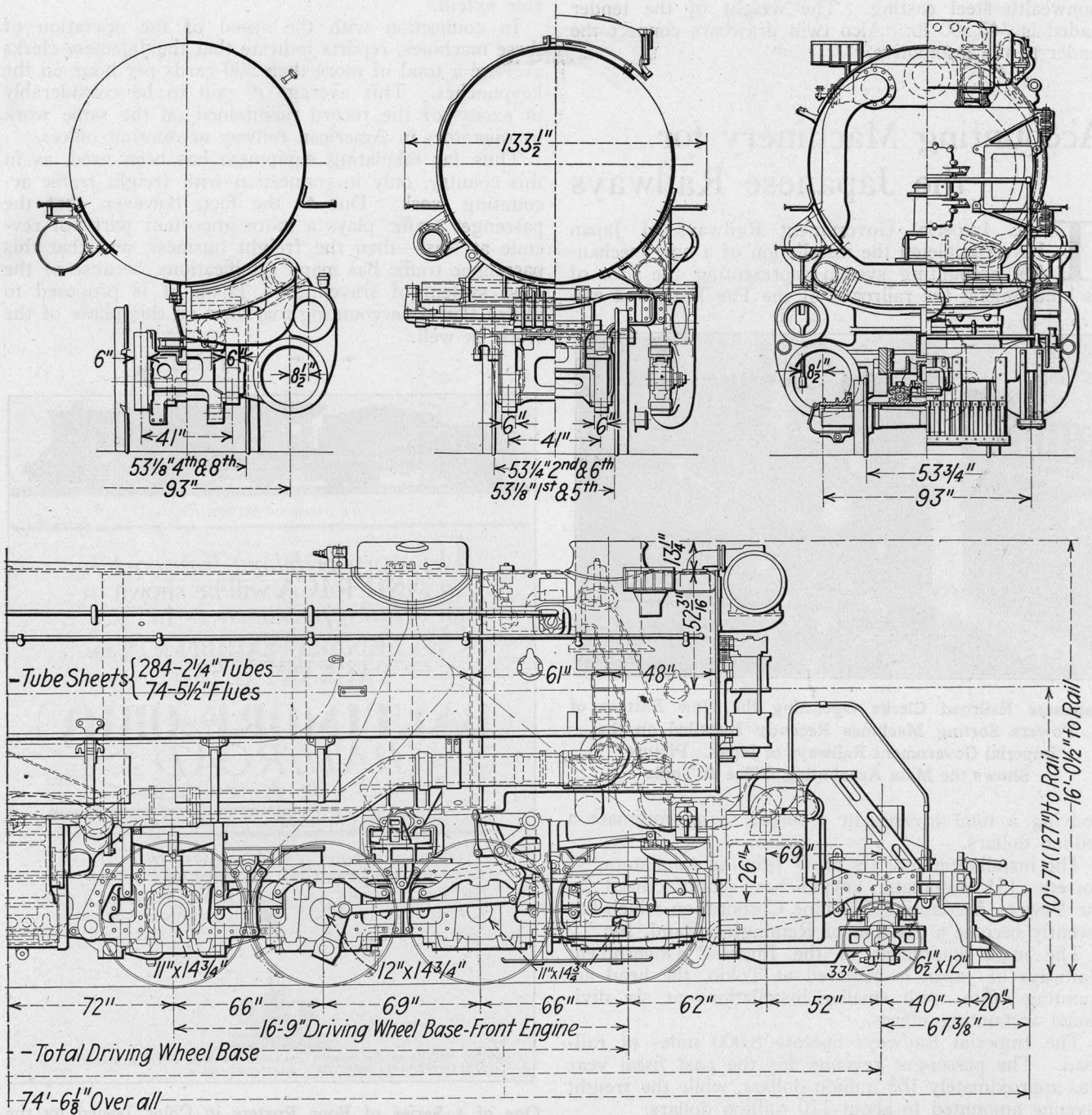
The exhaust from the front cylinders returns to the

bottom of the smokebox through a similar S-shape connection, while the exhaust from the rear cylinders is brought forward through a pipe on the left side, located similar to the steam pipe on the right side. Only two outside lines of pipe are required to convey the steam to and from the rear cylinders.

The Running Gear

The total weight of one of these locomotives is 649,000 lb., of which 40,500 lb. is carried on the engine truck, 559,500 lb. on the drivers, and 49,000 lb. on the trailer. The weight of the boiler carried on the front engine is transmitted through a single bearing. The driving wheel base of each engine unit is 16 ft. 9 in., while the total wheel base of the engine is 62 ft. 10 in.

The engine truck is the Alco design, outside bearing truck, using A.R.A. journal bearings, wedges and box lids, attached to a one-piece cast steel frame. Constant



Locomotive for the Denver & Rio Grande Western

resistance centering effort is provided through geared rollers operating on inclined planes, and a central semi-elliptic spring replaces the usual spindle. Alco renewable hub liners are applied to the inside faces of the truck boxes.

The trailer truck is also of Alco design and embraces an improved method of connecting the geared roller centering device to the frame structure so as to perfectly compensate for the radial swing of the truck, while the rollers travel in straight lines.

Each of these locomotives is equipped with an Elesco feedwater heater and one Hancock non-lifting injector, also Ashcroft cut-off control gages and the Alemite system of lubrication.

The tender, which has a capacity of 18,000 gal. of water and 30 tons of coal, is carried on two Commonwealth six-wheel trucks provided with clasp brakes. The wheels are 33 in. in diameter and have 6½-in. by 12-in. journals. The tender frame is also of a Commonwealth steel casting. The weight of the tender loaded is 343,500 lb. Alco twin drawbars connect the tender to the locomotive.