

# BALDWIN LOCOMOTIVES

JANUARY 1927





Moro Beagle Curve, One Mile from Atchee; 66 Degrees on a Grade of 7½ Per Cent



Near Moro Beagle Curve, Looking Toward Atchee

# Narrow Gauge Articulated Locomotive

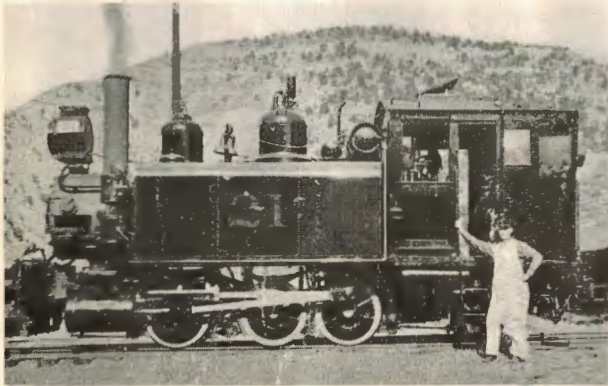
FOR THE

## Uintah Railway

An article describing the Uintah Railway was published in BALDWIN LOCOMOTIVES for July, 1923. The present article deals particularly with the most recent motive power developments on this exceptionally interesting railway.

It is a pleasure to acknowledge the courtesy of the Railway Company in furnishing information and photographs for use in the preparation of this article.—EDITOR.

**T**HE Uintah Railway is a line of three feet gauge, extending in a northerly direction from Mack, Colorado, a point on the Denver & Rio Grande Western Railroad, to Watson and Rainbow, Utah, a distance of 63 and 70 miles respectively.



One of the 0-6-2 Type Tank Locomotives, Built by The Baldwin Locomotive Works, 1905

Cylinders	13" x 18"	Weight, total engine	68,670 lb.
Drivers, diam.	34"	Tractive force	13,700 lb.

The road was built in 1904 for the specific purpose of transporting a form of asphalt commercially known as "gilsonite," which is mined in the vicinity of the Uintah Mountains in Utah. Gilsonite is extensively used in the preparation of paints, varnishes and insulating material, and in prepared roofings and floor coverings. It is a hydro-carbon in character, brittle in structure, intensely black in color and of the specific gravity of water. In the United States its occurrence is confined almost entirely to the Uintah Basin.

The chief problem in building the Uintah Railway was to cross the Roan or Book Plateau, a high ridge which separates the valley of the Colorado River on the south, in which Mack is located, and the Uintah Basin lying to the north. This ridge is crossed, at Baxter Pass, at a maximum

elevation of 8437 feet above sea level, or about 3900 feet above Mack. From Mack to Atchee, Colorado, where the shops of the railway are located, the distance is 28.3 miles and the rise in elevation 1884 feet. The steepest grade on this section of the line is 2.90 per cent. From Atchee to Baxter Pass, at the summit, a distance of 5.9 miles, the total rise is 2012 feet, and the grade for the greater part of the distance 7.5 per cent. The line descends thence to Wendella, a distance of 6.7 miles, on an almost continuous grade of 5.0 per cent. Continuing from Wendella to Watson, 62.8 miles from Mack, the grade is descending, and varies between the limits of 1.10 and 3.34 per cent.

In a distance of 12 miles, which includes the steepest grades on the line, there are 233 curves, varying from 4 to 66 degrees. The grades are compensated, and on the 66-degree curves the rails are spread  $\frac{7}{8}$ -inch. The greater part of the line is laid with rails weighing 60 pounds per yard.

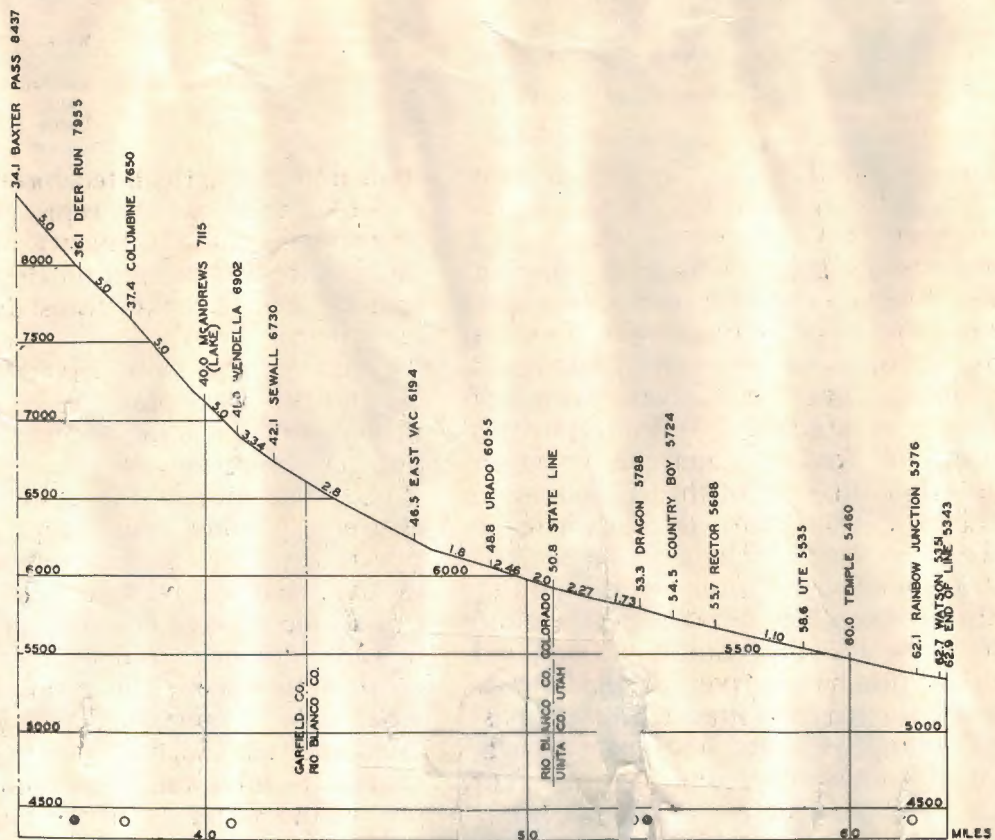
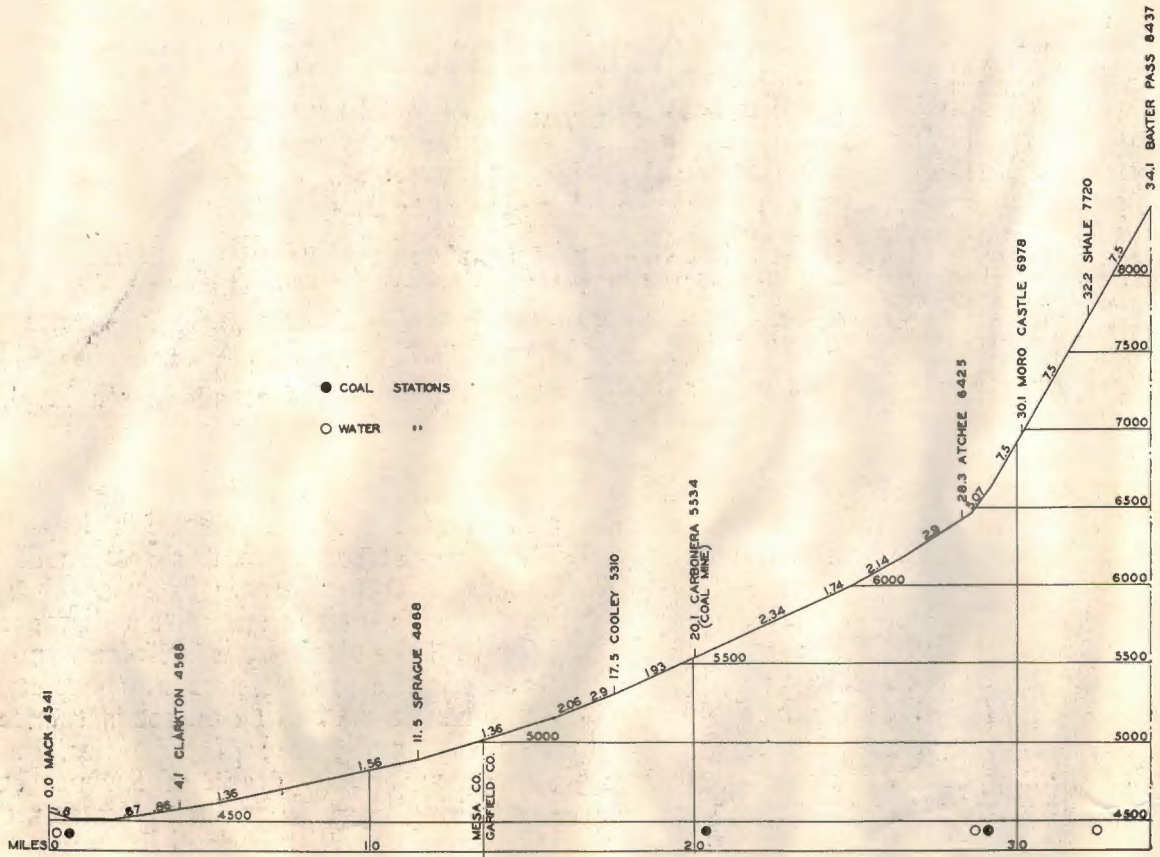
The Uintah Railway is a common carrier, handling both freight and passenger traffic,



Consolidation Type Locomotive, Originally Built by The Baldwin Locomotive Works in 1896, and Purchased by the Uintah Railway in 1917

Cylinders	16" x 20"	Weight, total engine	70,800 lb.
Drivers, diam.	37"	Tractive force	20,600 lb.

BALDWIN LOCOMOTIVES



Profile of the Utah Railway

Rainbow is at the terminus of a branch which leaves the main line at Rainbow Junction. Grades are in per cent, and elevations at stations, and distances from Mack, are noted.



Right and Left Hand Views of the New Articulated Locomotive

Cylinders (4)	15" x 22"	Tubes, diam.	5 $\frac{3}{8}$ " & 2"	Water heating surface	2100 sq. ft.	Weight on drivers	194,500 lb.
Drivers, diam.	42"	" number	5 $\frac{3}{8}$ ", 24; 2", 146	Superheating surface	505 sq. ft.	" total engine	236,300 lb.
Boiler, diam.	64"	" length	18' 0"	Wheel base, rigid	7' 8"	Tank capacity	2800 U. S. gal.
Steam pressure	210 lb.	Grate area	37.4 sq. ft.	" " total engine	38' 3"	Fuel "	9000 lb.
Firebox	106 $\frac{1}{8}$ " x 66 $\frac{1}{8}$ "					Tractive force	42,100 lb.

and operating under exceptionally difficult conditions. Representatives of the Interstate Commerce Commission, who visited the property in July, 1924, pronounced it the most difficult operating proposition they had ever seen. The motive power, previous to July, 1926, consisted of six geared and seven direct connected locomotives. Of the latter, two are of the 0-6-2 type with side tanks and are used chiefly in passenger service; while three are of the Consolidation (2-8-0) type, and two of the Mikado (2-8-2) type for freight service. The geared locomotives handle freight traffic over the steep grades between Atchee and Wendella, while the Consolidation and Mikado type locomotives handle these trains on the lighter grades. Each passenger locomotive can haul one coach, weighing 35 tons, over the 7 $\frac{1}{2}$  per cent grade without assistance.

In July, 1926, The Baldwin Locomotive Works delivered to the Uintah Railway a

high pressure articulated locomotive of the 2-6-6-2 type, which represented a great increase in hauling capacity over any locomotive previously used on the line. It was largely due to the foresight and wide experience of Mr. L. C. Sprague, General Manager of the Uintah Railway, that this locomotive was purchased, as it was a rather bold experiment in view of the unusual conditions which the engine was expected to meet. The results so far have entirely justified the step; but before referring to the service rendered, the locomotive itself will be described.

This locomotive develops a tractive force of 42,100 pounds; and with 194,500 pounds on driving wheels, the ratio of adhesion is 4.62. The average load per driving axle is approximately 32,400 pounds; and 82 per cent of the total weight, including the supply of fuel and water, is carried on the drivers.

In view of the excessive curvature on the line, the design of the running gear of

this locomotive was given most careful consideration. The arrangement of the frames is in all respects similar to that used on Baldwin Mallet compound locomotives. The radius bar connecting the front and rear frames is attached to the former by a horizontal pin, and at its rear end has a ball jointed connection with a vertical pin



The New Articulated Locomotive on the 66-Degree Curve and  $7\frac{1}{2}$  Per Cent Grade at Moro Castle

which is seated in the back cylinder saddle. This construction provides ample flexibility in both a horizontal and vertical direction.

The leading truck is of the Economy constant resistance type, with cast steel frame and outside journals. The load carried by the forward equalizer is transferred to the truck frame through a single rocker placed on the center line. This truck is designed to swing  $6\frac{3}{4}$  inches on each side, and is equalized with the driving wheels of the front unit.

The back truck is of the Delta type and is equalized with the rear group of drivers. The locomotive frames are supported on the truck frame through two constant resistance rockers, whose centers are 9 feet 6 inches apart transversely. There is, practically no overhang at the rear end; so that, while ample flexibility is provided, the frames are very stably supported. The driving wheels of the middle pair in each group have plain tires.

The boiler is supported on the front frames by a single sliding bearing placed between the second and third pairs of driving wheels, and designed to permit a rocking movement in a vertical plane. There is a rigid support at the cylinder saddle of the rear engine, and the firebox is supported on sliding shoes at the front and back.

The boiler itself requires no special comment. It is of the straight-top type, with a sloping back head and roof sheet. The firebox extends over the rear driving wheels and contains a Gaines bridge wall. The fuel used is a good grade of bituminous coal, and the grates rock in four sections, and have drop-plates at the back.

The dome is centrally located on the barrel, and an internal dry pipe leads forward from the throttle to the smokebox. The superheater is a type "A," with 24 elements. Live steam is conveyed from the header to the rear

cylinders through two external pipes which pass out through the top of the smokebox, and are heavily lagged. Just above the steam chest these pipes branch, and the branches unite in a single flexible pipe placed on the center line, which conveys live steam



Pushing Empties for the Mines up the 5 Per Cent Grade Between Rainbow Junction and Rainbow

to the cylinders of the front unit. The exhaust from the rear cylinders is conveyed forward to the smokebox through external, rigid pipes; while the exhaust from the front cylinders passes through a flexible pipe,



Pulling Out of Thimble Rock Mines, on a  $7\frac{1}{2}$  Per Cent Grade and 66-Degree Curve

which is placed on the center line. The nozzle in the smokebox has a central circular tip through which the front exhaust is discharged, and two semi-annular tips for the exhaust from the rear engine.

The steam distribution to all the cylinders is controlled by 8-inch piston valves, which are set with a travel of 5 inches and a lead of  $\frac{1}{8}$ -inch. The steam lap is  $\frac{13}{16}$ -inch, and the exhaust lap zero.

The valve gears are of the Walschaerts type, and are controlled by a power reverse mechanism. The front and back reverse shafts are connected by a jointed reach rod, which is placed on the center line of the locomotive.

The boiler is fed by one non-lifting and one exhaust steam injector, the latter being placed on the right-hand side and receiving its steam supply from the exhaust of the rear cylinders. The fuel supply is carried in a box placed back of the cab, and the

wheels, and the Le Chatelier brake is applied to the cylinders of the rear engine. Air is supplied by two  $9\frac{1}{2}$ -inch pumps which are mounted on the forward deck plate; and there are two air-drums, placed right and left on top of the water tanks.



East Bound at McAndrews Station, Hauling 250 Tons on a Grade of 5 Per Cent

Sand is delivered in front of the leading drivers from a rectangular sandbox placed on the forward deck plate; while a box placed over the boiler supplies sand to the front and rear drivers of the back engine.

Each unit is equipped with a mechanical force feed lubricator, having four feeds which lead to the cylinders and steam chests. The air pump cylinders are lubricated by a single-feed bull's eye lubricator.

Owing to the swing of the front cylinders when traversing sharp curves, it was found impracticable to apply a manually operated cylinder cock



East Bound with a Train of Ore, Rounding a 66-Degree Curve at Mile Post 39

This picture was taken from the rear end of the train

rigging; and the cylinder cocks, therefore, are operated by air.

This locomotive has a height over all of 14 feet 2½ inches, and an extreme width of 10 feet 1 inch; while the length over the outside faces of the front and rear bumpers, is 45 feet 8 inches. These are very liberal dimensions for a locomotive of only three feet gauge, but in service the locomotive has proved more stable on the track than

about two miles, where they are assembled into trains for movement over the mountain. Conditions at Thimble Rock mines are particularly difficult owing to the combination of 7.5 per cent grades and 66 degree curves, and the short haul work here was formerly done by the light tank locomotives of the 0-6-2 type.

From Wendella to Baxter Pass, on the ascending grade of 5 per cent, the new locomotive handles as much tonnage per train as two of the geared locomotives, and makes the run in a little more than half the time. While it is as yet too early to quote exact figures, it is evident that this represents a great reduction in the operating expense per train mile, as well as a reduction in overtime and a considerable increase in the track capacity of the line. Furthermore, it is expected that the maintenance expense of this



Stopping for Water at Columbine on the 5 Per Cent Grade, East Bound

This locomotive, No. 30, is the heavier of the two Mikados (2-8-2 type) in service on the road. It was built by The Baldwin Locomotive Works in 1911, and has 19" x 22" cylinders and 40" drivers. The total weight is 145,000 lb., with 116,000 lb. on drivers, and the tractive force is 30,300 lb.



Loading a Train with Gilsonite at Pigeon Toe Mine, Rainbow

any of the smaller locomotives in use on the road.

The new locomotive is at present operating on the northern section of the line, between Baxter Pass, at the summit of the Book Plateau, and the mines in the vicinity of Watson. The locomotive hauls cars loaded with gilsonite from Thimble Rock mines to Rainbow, a distance of

locomotive will be less than that of one geared unit.

The locomotive has fully demonstrated that it can be safely operated on the severe grades and curves between Atchee and Baxter Pass on the south side of the mountain, showing the same increase in speed and hauling capacity as on the north side. In fact, the management of the railway has



in view the eventual replacing of practically all the older locomotives, both geared and direct connected, with locomotives of the articulated type.

The tonnage rating of the new locomotive on various sections of the line is as follows:

LOCATION	MAXIMUM GRADE PER CENT	TONNAGE
Mack to Atchee	2.9	525
Atchee to Baxter Pass	7.5	145
Watson to Dragon	1.10	1150
Dragon to Wendella	3.34	525
Wendella to Baxter Pass	5.0	240

These tonnages are approximately double those assigned to the heaviest geared locomotive, and 75 per cent in excess of those assigned to the heaviest direct connected, non-articulated locomotive, which is of the Mikado (2-8-2) type, as illustrated on the opposite page.

The experience of the Uintah Railway is confirming that of a number of logging roads in the Northwest, where, in spite of exceptionally difficult operating conditions, direct connected articulated locomotives, suitably designed and intelligently handled, are proving the most efficient type of motive power on their respective lines.



A View near Rainbow Mine