ROCKY SAYS, " Let's learn about the two Cascade Tunnels."

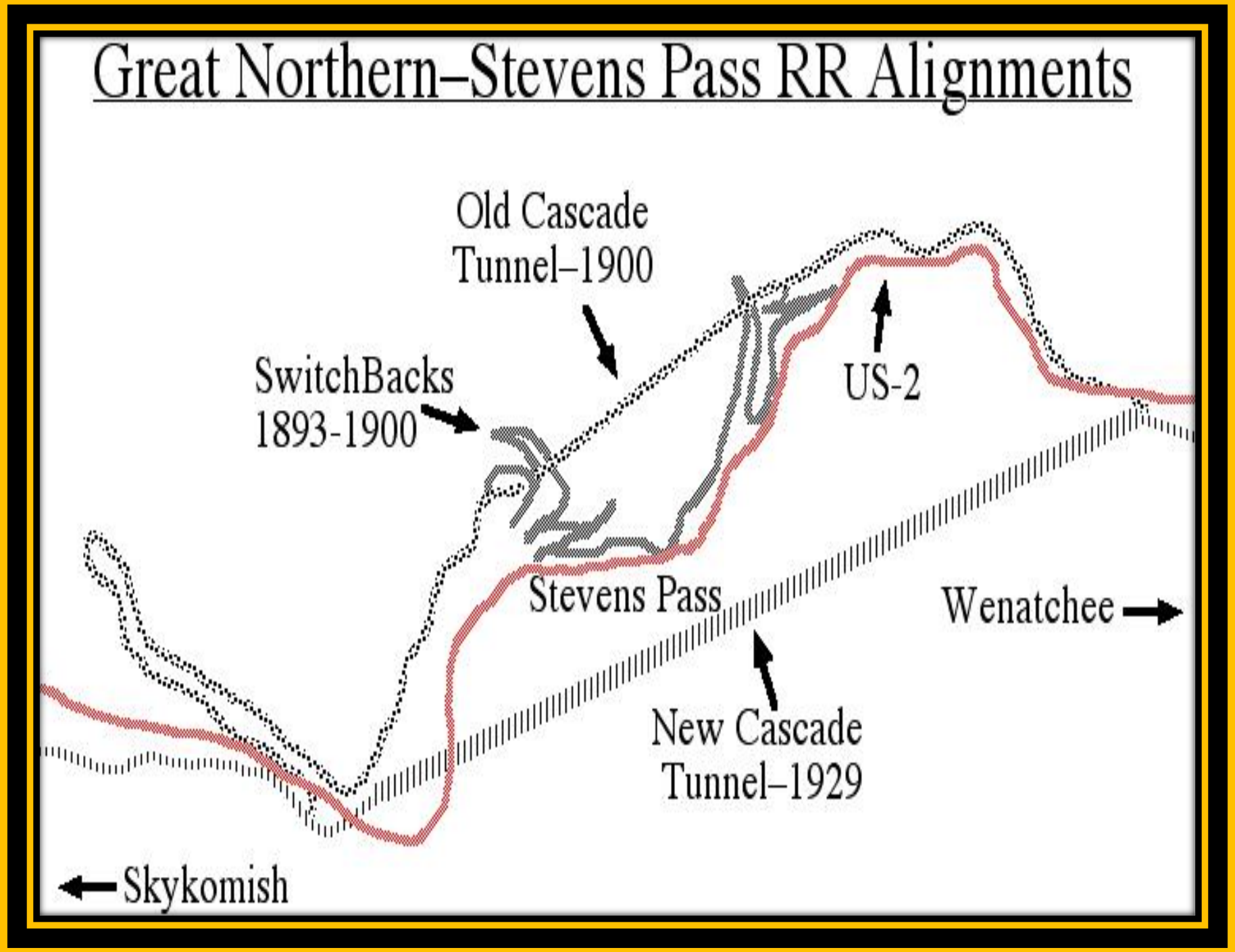
For those of you who may not be aware of this, there are actually two Cascade Tunnels;
The first tunnel was opened in 1900 and replaced in 1929 with the new Cascade Tunnel.

But first, lets look at each tunnel separately, where they are in Washington and then, why are there two Cascade Tunnels?

Location of the tunnels between Skykomish and Wenatchee, WA.

- Prior to the construction of the first Cascade Tunnel which would have to be bored through solid granite, the GN realized it would take several years. So, in order for the GN to cross the Cascades to complete their transcontinental line, surveyors recommended that a temporary switchback arrangement could be used to cross the summit in short order. To achieve reaching the summit would require 12 miles of track and 8 switchbacks! Five on the west side and three on the east side. The switchbacks which were completed in 1892 had a vertical rise of 677’ on the east side and 898’ on the steeper west side. It soon became apparent that the tunnel would have to be built.
- Needless to say, operations would be slow. Under normal conditions, it could take up to 2 hours to traverse the switchbacks. Under adverse conditions, it could take up to 36 hours!

Postcard showing the switchbacks.

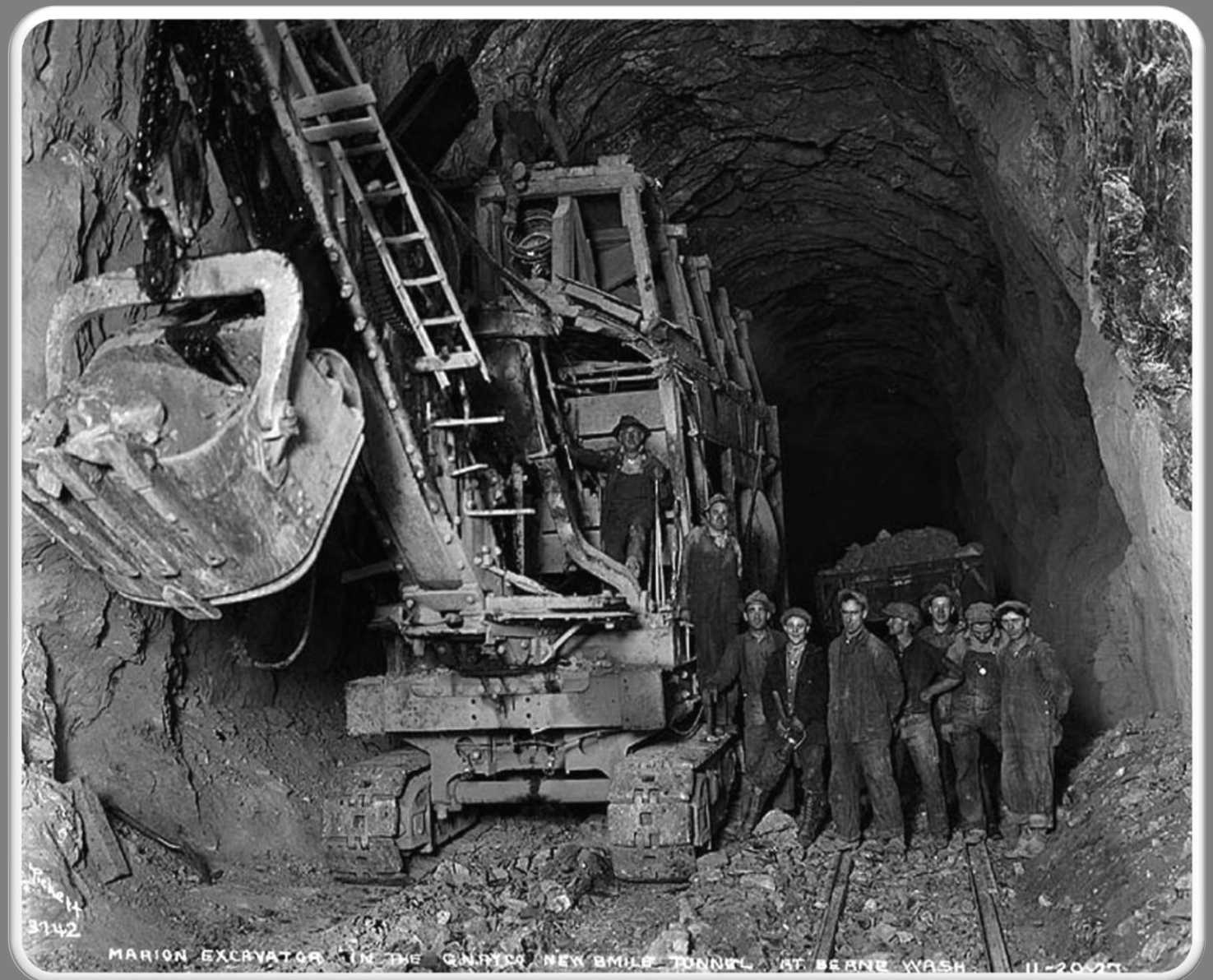

Great Northern–Stevens Pass RR Alignments
Old Cascade
Tunnel–1900
SwitchBacks
1893-1900
US-2
Stevens Pass
Wenatchee
New Cascade
Tunnel–1929
Skykomish

- The tunnel to eliminate “Death Mountain” was surveyed and actual construction began in 1897. The granite was so tough, that some drilling proceeded only several feet per day. Nearly 800 men were employed in its construction. The tunnel headings for the 2.63 mile tunnel met in September, 1900 and regular service began in December.
- Steam power was used to move the trains through the tunnel. This proved to be dangerous, and was! 100 passengers were almost asphyxiated when a train stalled in the tunnel.
- On July 10, 1909, a 3 phase, 6600V AC electrification was completed. This necessitated having 2 trolley wires running parallel to each other with the rails being the return. Speeds ranged between 7 and 15mph depending on which induction windings were selected. Four, 3-phase boxcabs were built by GE developing 1500HP each and incorporated regenerative braking whenever speed exceeded the synchronous speed of the traction motors. The motors automatically became generators and returned power to the wires. A major issue with the 3 phase system was the trolley poles tended to come off the wires.

Three Phase Power

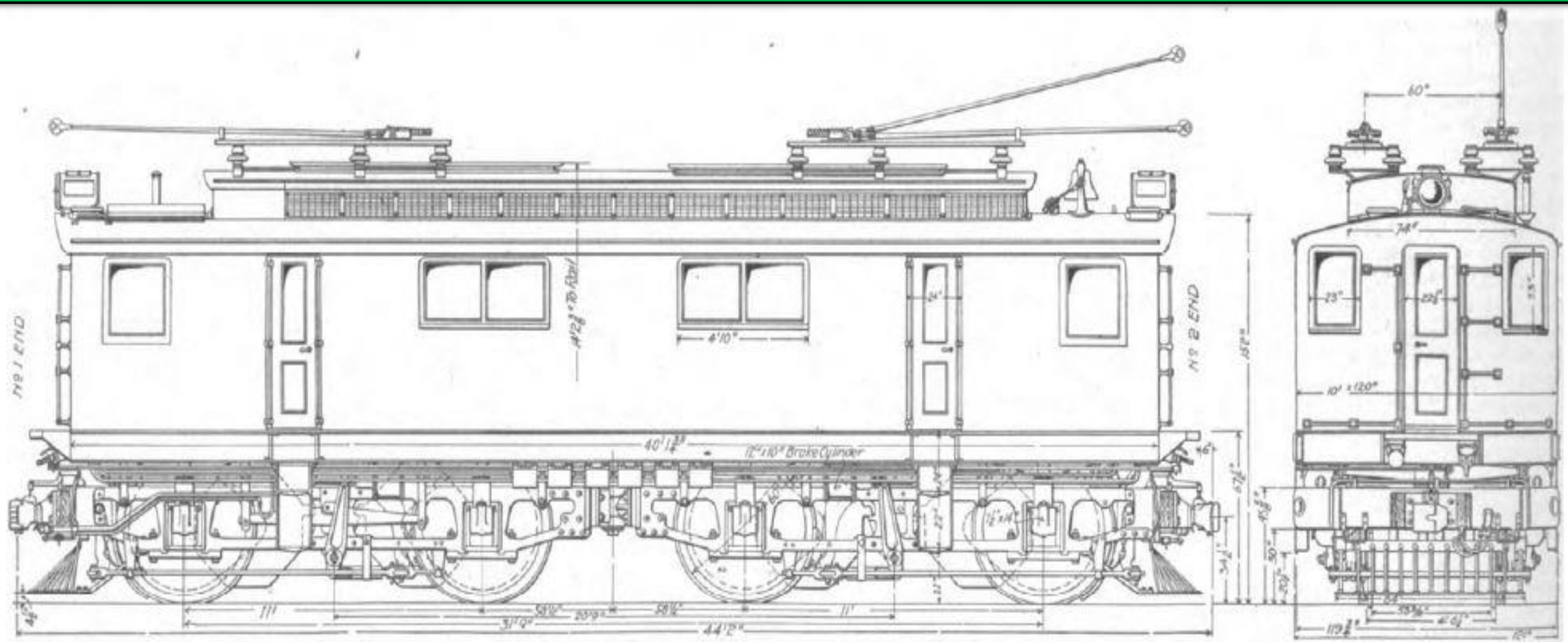
- Common method of transmitting AC power in grids worldwide
- AC of same frequency is in each wire, each offset by 1/3 cycle
- Transmits 3 times as much power as single phase AC, but with only 1.5 times the wire (3 wires vs. 2)
- Power transfer into a linear balanced load is constant, which helps to reduce generator and motor vibrations.
- Three-phase systems can produce a rotating magnetic field with a specified direction and constant magnitude, which simplifies the design of electric motors, as no starting circuit is required.
- A three-phase induction motor has a simple design, inherently high starting torque and high efficiency.
- A three-phase motor is more compact and less costly than a single-phase motor of the same voltage class and rating

Digging the first Cascade Tunnel



PORTAL FOR THE TUNNEL.

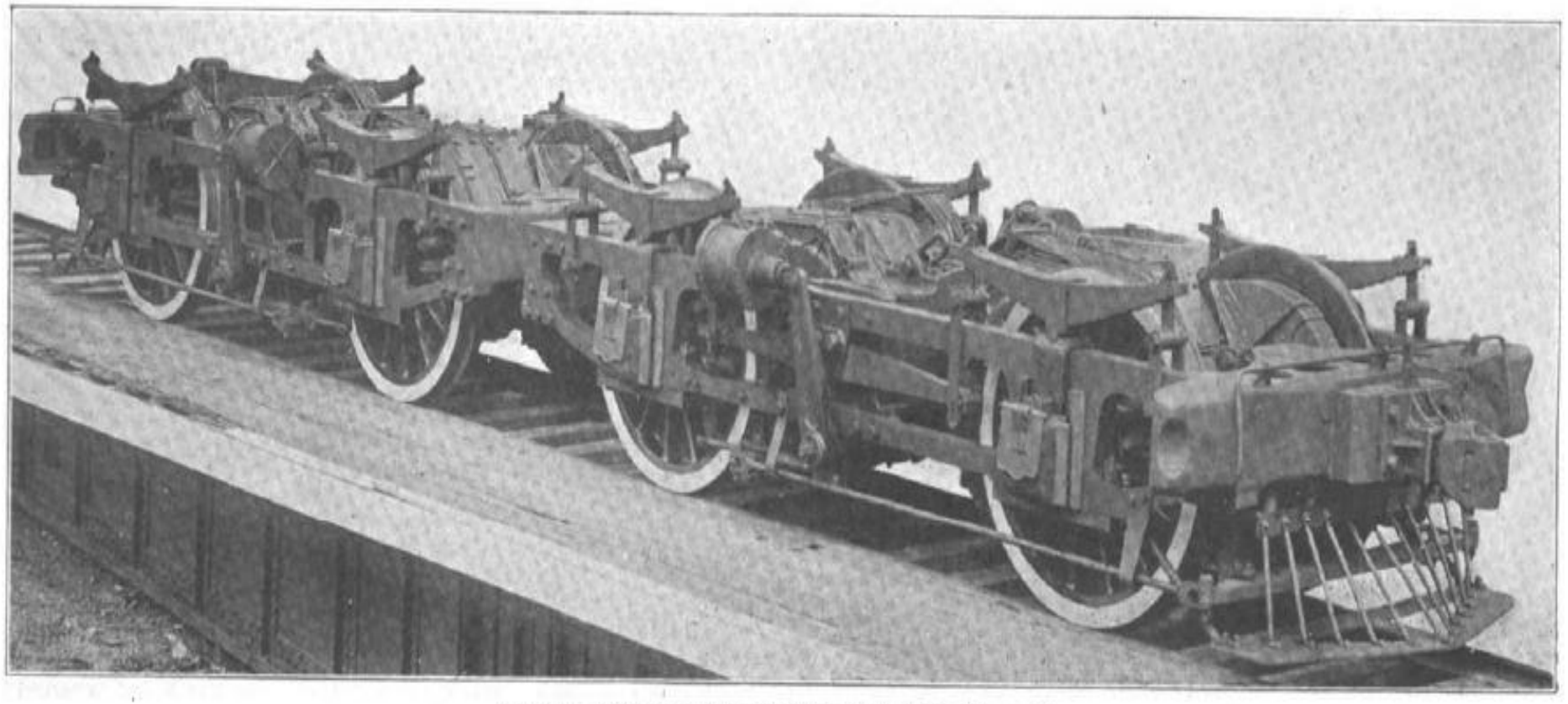
GE DESIGN FOR THE 3 PHASE ENGINES.



Side and End Elevation of Three-Phase Electric Locomotive for the Great Northern Ry.

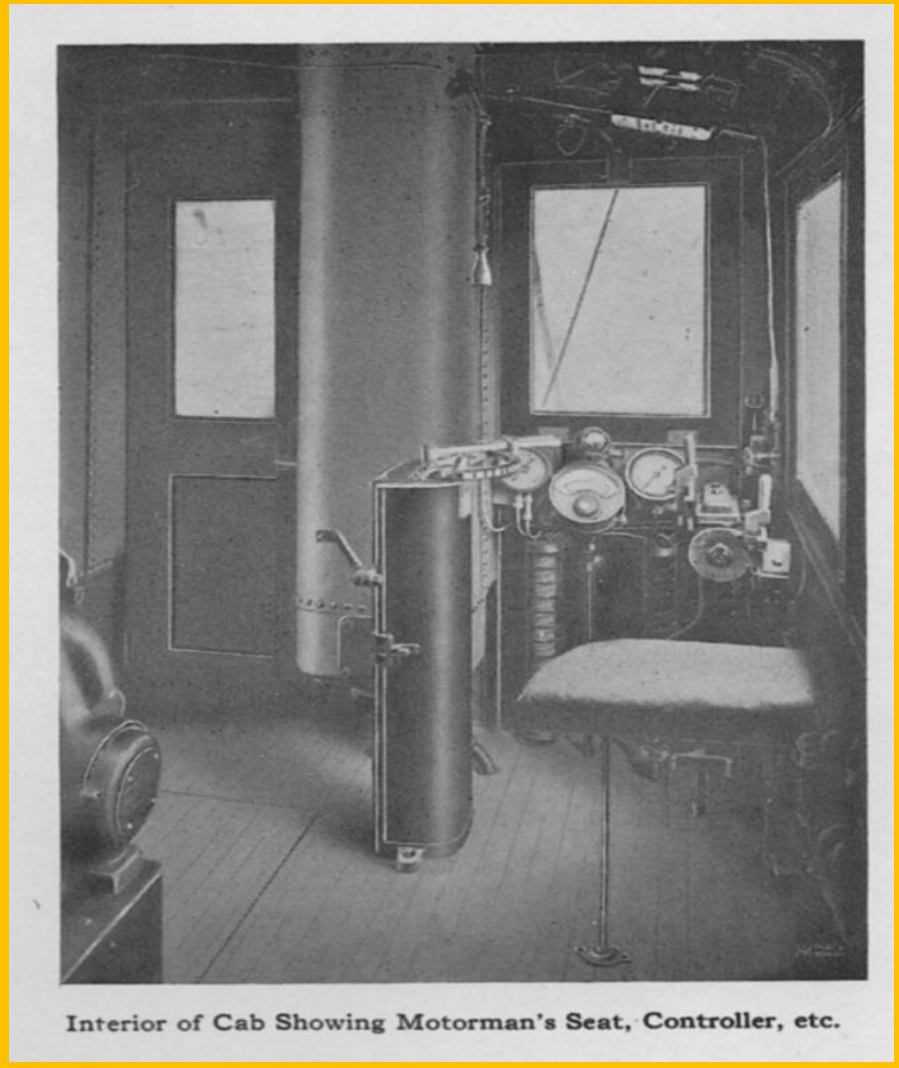
GN 3 PHASE MOTOR AT GE.
ROAD NUMBERS
5000-5003

Trucks for 3 Phase Engines.



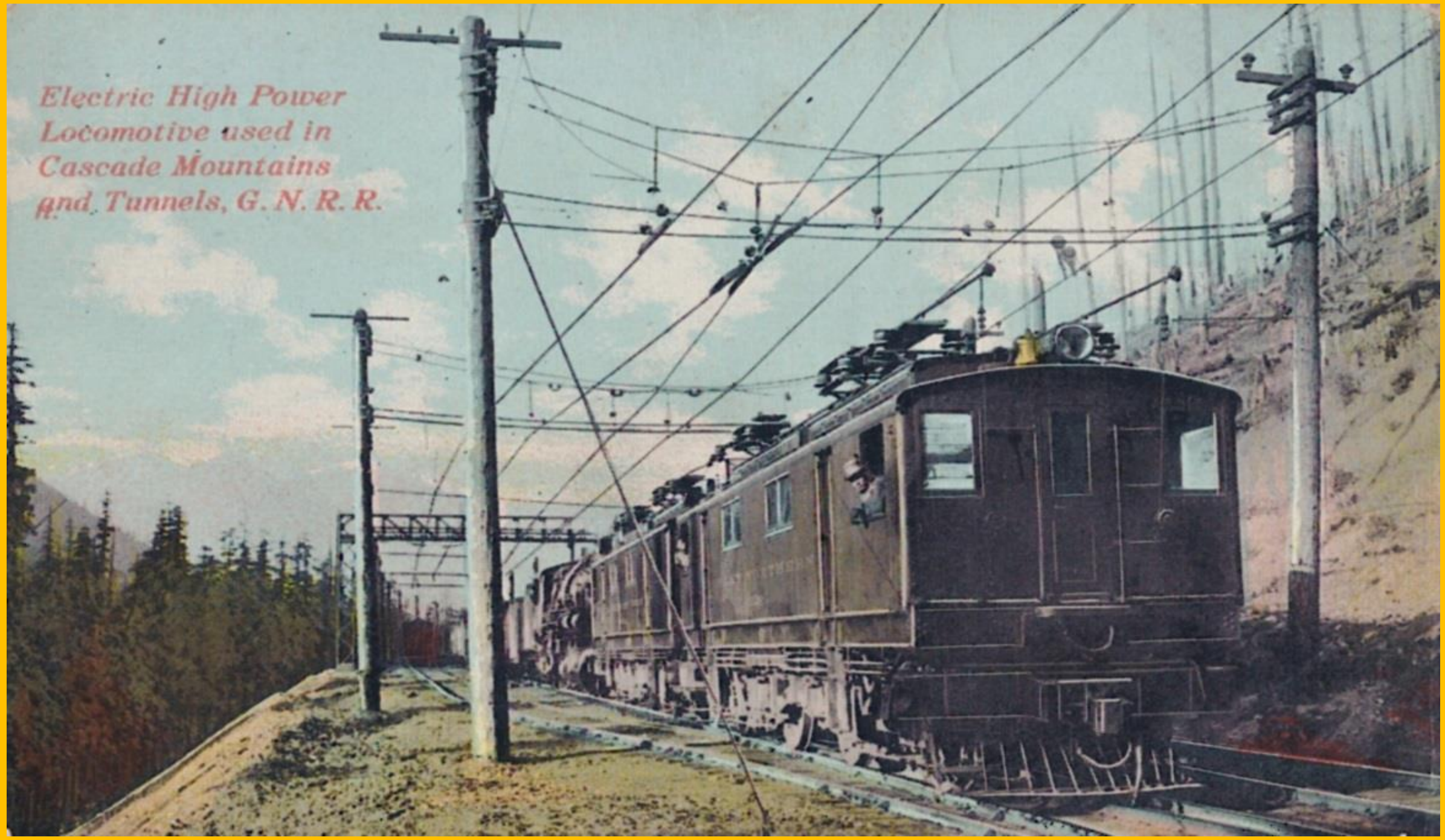
Trucks of Electric Locomotive, Great Northern Ry.

Interior of cab, 3 Phase Engines. Note the Simplicity.



Interior of Cab Showing Motorman's Seat, Controller, etc.

3 Phase electric locomotives.
Note the dual trolley wires and poles.


Electric High Power
Locomotive used in
Cascade Mountains
and Tunnels, G. N. R. R.

3 Phase motors exiting the tunnel.

While the electrification eliminated the toxic fumes, it could not eliminate the problem of snow.

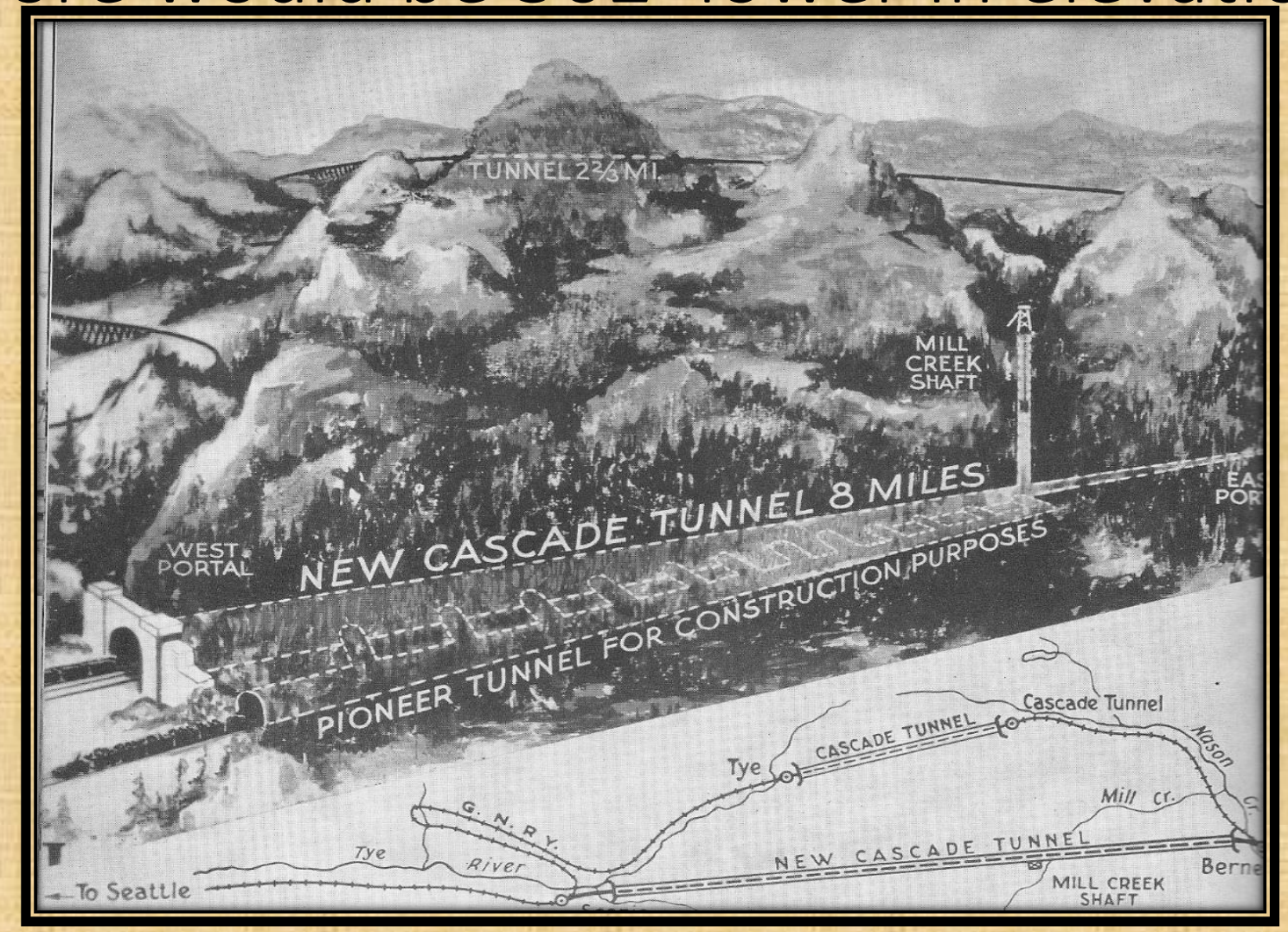
On March 1, 1910 a disastrous 2000' wide avalanche destroyed the GN right of way and the town of Wellington, WA. It was rebuilt and renamed Tye.

Views Showing the Disaster to the Three-Phase Equipment of the Cascade Tunnel—Great Northern Railroad

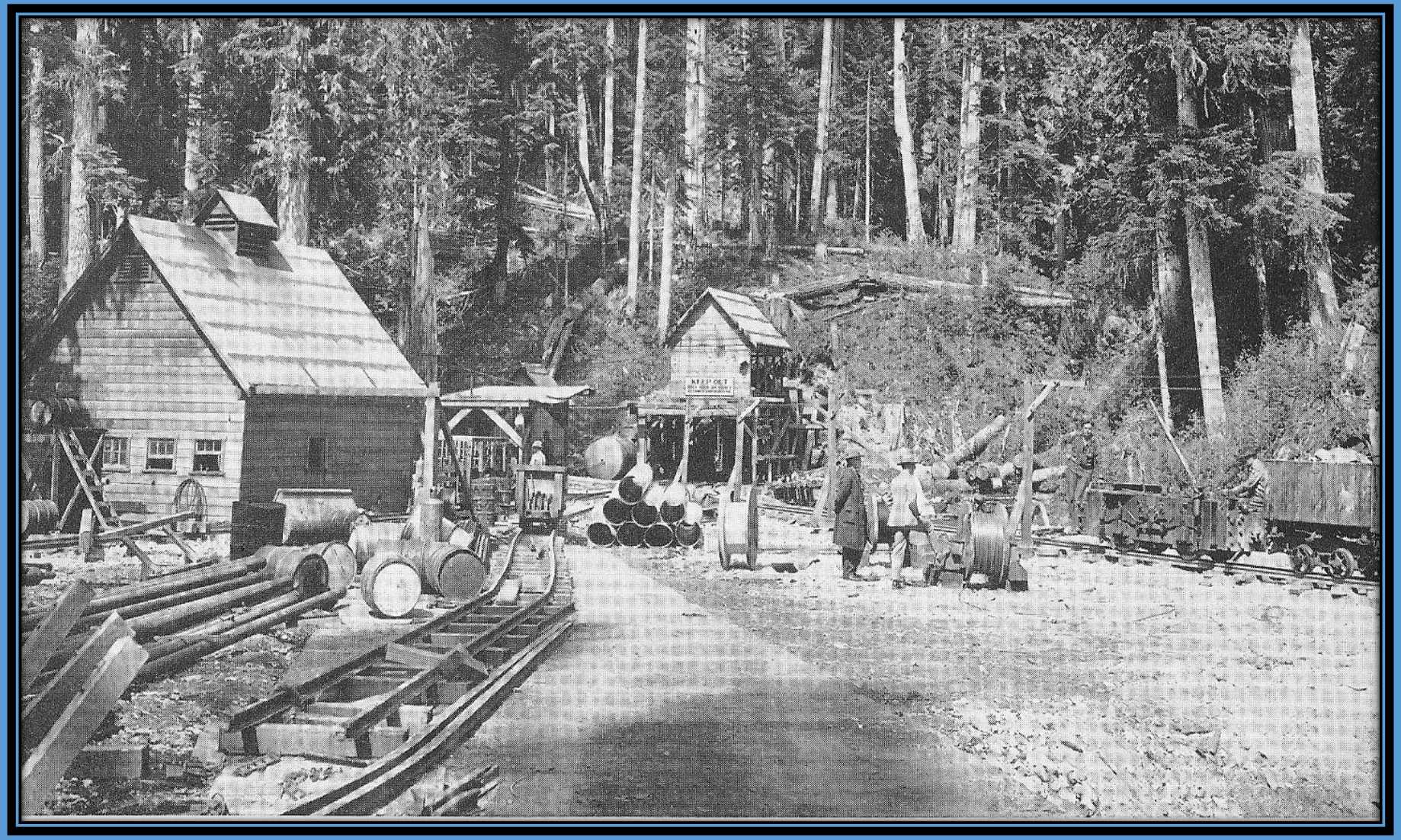
Due to the extreme elevation of the tunnel and the snow conditions, studies for a new tunnel were made between 1916-1917.
This would include a 7.79 mile tunnel. On November 26, 1927 the go ahead was given by the GN's Board of Directors.

The new tunnel and route would be electrified for 75 miles between Skykomish and Wenatchee, WA with 11000V AC, 25 cycle catenary similar to the New Haven and PRR.

Location of original Cascade Tunnel and surveyed location for the new, 7.9 mile tunnel. The new bore would be 502’ lower in elevation.



Beginnings of the west portal in June of 1926.



The same location four months later, October 1926.

Some Cascade Tunnel Statistics. The project involved 1750 workers, the cost was one million dollars per mile. The tunnel is 26' high and 18' wide. Construction began in June, 1926 and was completed on Dec. 28, 1928. It opened for service Jan. 12, 1929. It is the longest tunnel in the western hemisphere!

The new route which eliminated the steep grades required to reach the original Cascade Tunnel increased trains from 2500 tons to 5000 tons and permitted crossing the summit in an hour. It takes 15 minutes to traverse the tunnel.

Grand opening of the new Cascade Tunnel on December 28, 1928.

First train to break banner opening the tunnel.

An example of snow drifts that had to be cleared.

GN poster proclaiming the opening of the tunnel.

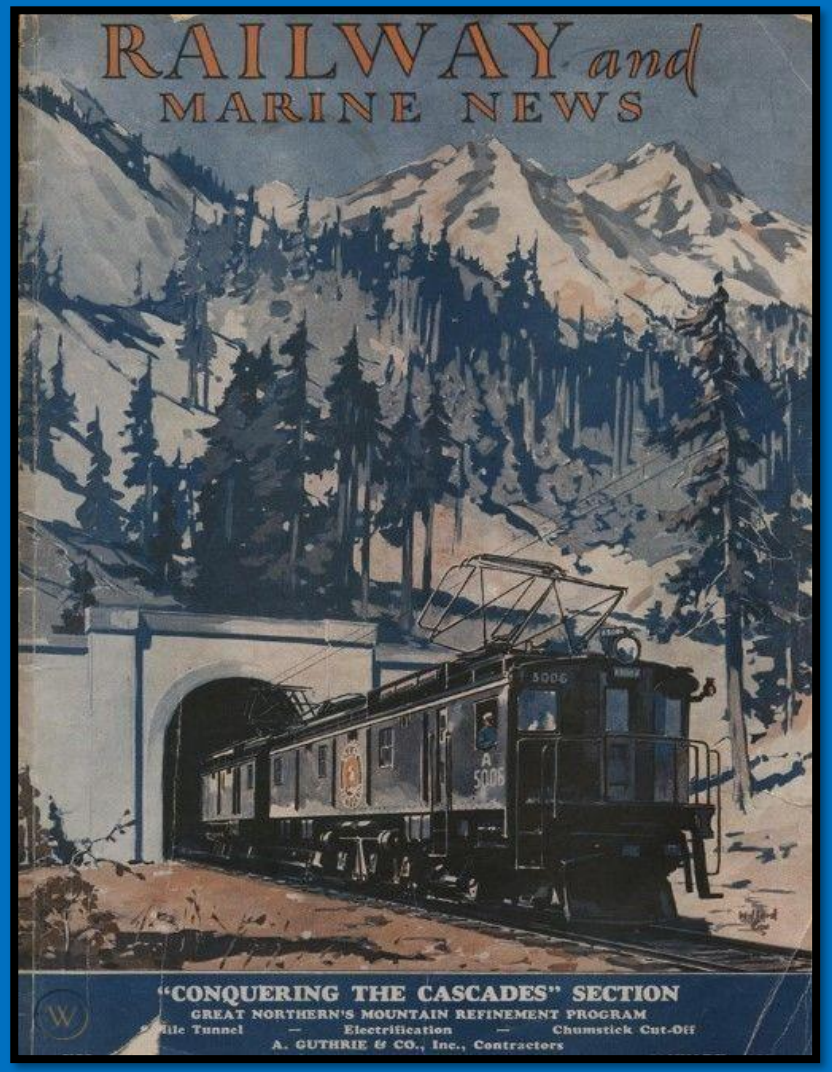
Motors built for service for the new Cascade Tunnel between Wenatchee and Skykomish, WA that comprised 75 miles.

Baldwin-Westinghouse built 10 class Z-1 motor-generator units between 1926-1929.
They were semi-permanently coupled in pairs. Each pair was considered one engine.

Each unit weighed 284,800 pounds and had four, 540hp motors developing 2160hp and had a 1-D-1 wheel arrangement.

Brand new Z-1s. Road numbers 5000-5009

RAILWAY and MARINE NEWS featured Z-1s exiting the Cascade Tunnel, 1929



Recorded for posterity by GN photographer Lee Pickett the first east to west train through the new tunnel bursts into foggy daylight with a pair of Z-1 motors.

Class Z-1 motor in service.

Between 1927-1928 the GN ordered 8 class Y-1 motors from Alco-GE. They had six, 550HP motors for a total of 3300HP in a 1-C+C-1 wheel arrangement. As with the Z-1's, these too were motor-generators. Road numbers 5010-5017

Y-1 inside tunnel.

The GN retrofitted the Y-1's with "stingers." These permitted the transfer of 11,000 VAC from one unit to another, reducing the number of raised pantographs.

Great Northern 5013

Don Ross Collection

Y-1 with steam generator car at Skykomish.

Y-1 on a passenger train. Note steam generator car behind the motor.

In 1945, Y-1 No. 5011 was destroyed in a major derailment. The interior machinery however did survive. The GN purchased new FT cabs and built a new carbody. It was the only streamlined Y-1 and was classified Y-1a.


5011
GREAT NORTHERN
5011


GREAT NORTHERN
G.N.
Q2516

In 1947, the GN purchased its last 2 electrics; the massive class W-1, 5018-5019. They too were motor-generators, they had a B-D+D-B wheel arrangement; developed 5000hp, were 101’ long and weighed in at 735,000 pounds, more than a Big Boy without the tender.


5011
GREAT
GNR Photo courtesy
Reinhard Krischer

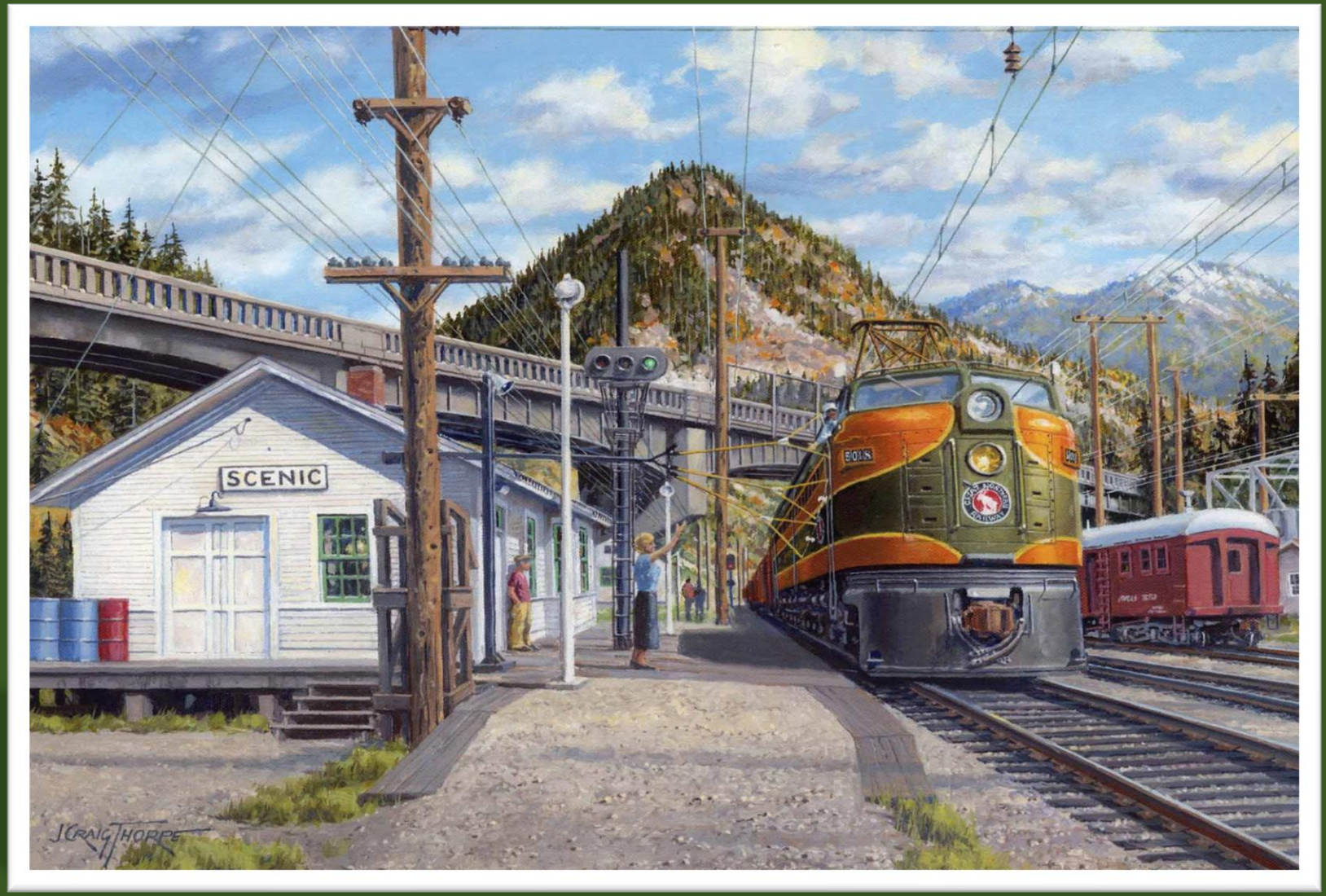
W-1 at Skykomish.

W-1’s and Z-1’s at the electric shops in Wenatchee, WA.

Unfortunately, these motors were in service for only 9 years until July, 1956 when the GN eliminated the electrification when the tunnel was dieselized. One unit was scrapped, the other was sold to the UP to become part of an experimental turbine.

"Rocky's" Motors in Service.

Painting of W-1 5018 getting “19” orders at Scenic, WA.

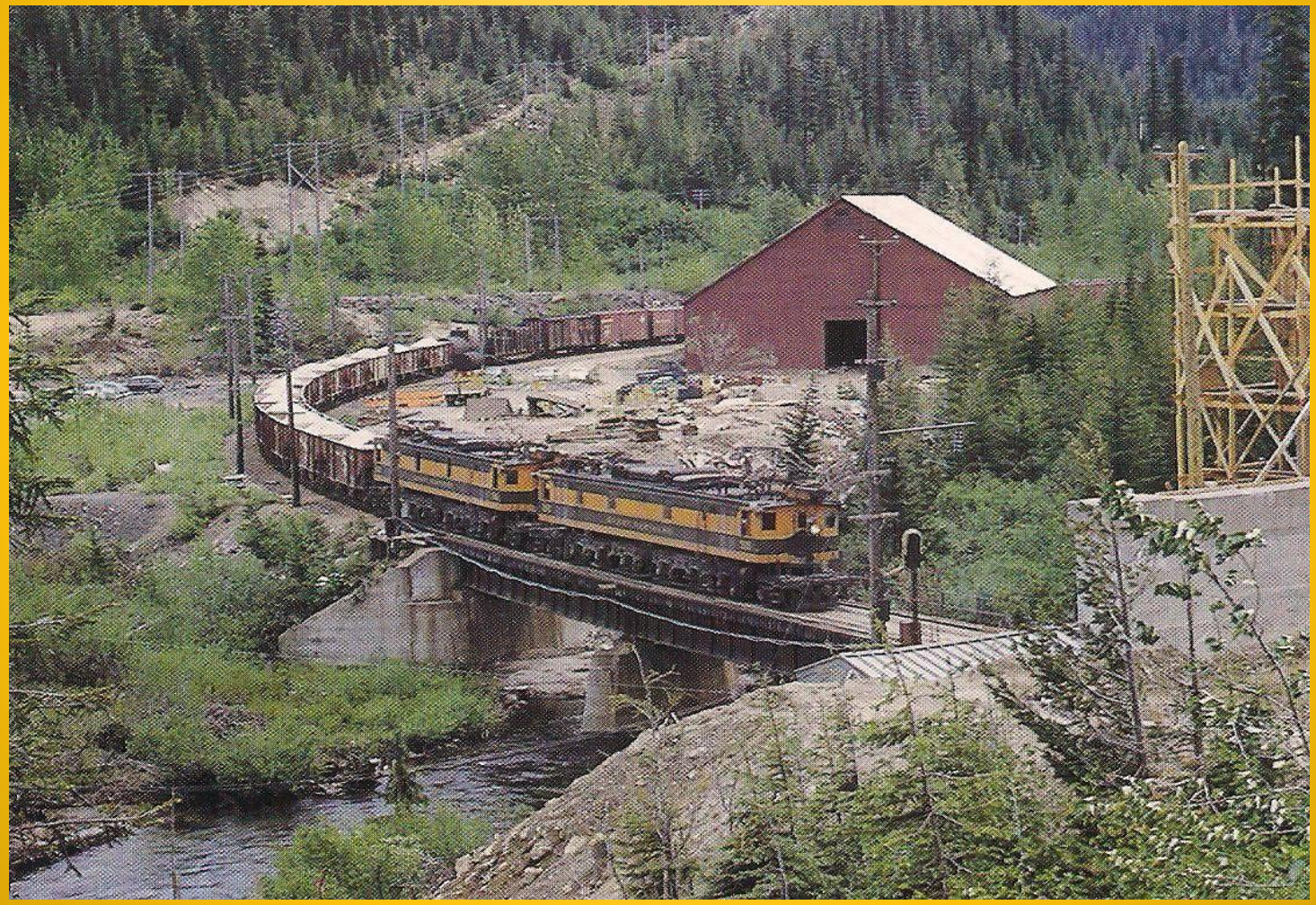


W-1 and Z-1’s at Wenatchee, WA.

W-1 emerging from the tunnel.

Massive W-1 near Chumstick, WA. July, 1953.

Y-1’s approaching the tunnel. The construction to the right is for the new ventilating fans.

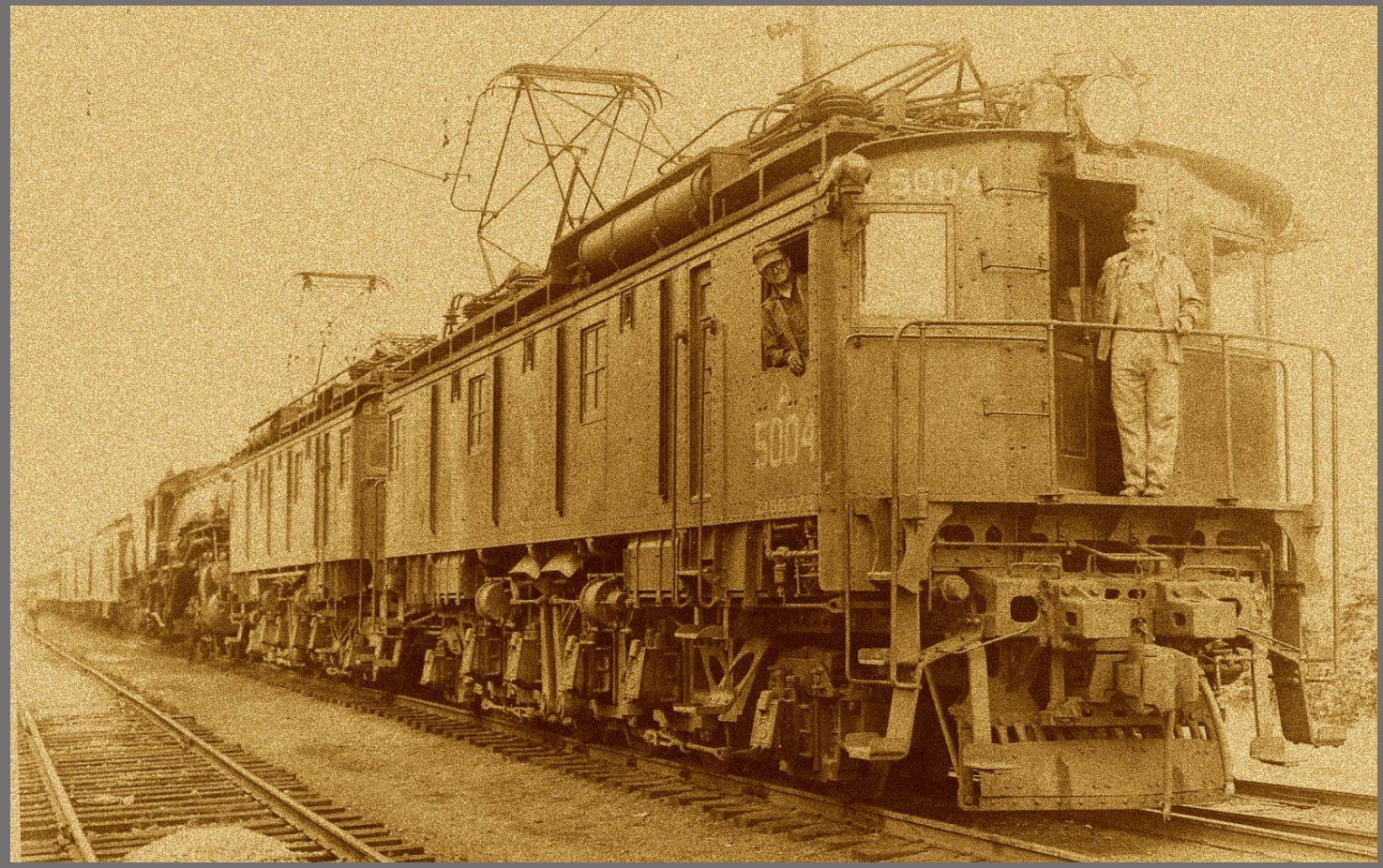


The GN's electrification was uneconomical. It was necessitated by the tunnel, and trains had to change power twice. While the motors cost less to maintain than steam, they cost twice as much to maintain as diesels. The GN investigated extending the wires to Spokane, but the traffic density was too low and the power companies would not compromise on rates. In July of 1956, the GN activated a new tunnel ventilating system which allowed diesels to operate through the tunnel. The expensive electrification was turned off and dismantled. The Z-1s were scrapped. One W-1 was scrapped and the other sold to the UP. All of the Y-1s + the Y-1a were sold to the PRR and became their class FF2.

LAST RUN: On July 31, 1956, No. 5018 emerged from the East Portal of Cascade Tunnel. Soon afterward the new ventilating system was activated, power to the catenary was turned off, and diesels operated through from the east to Seattle.


Where did the motors go after the wires came down?
GREAT NORTHERN

All of the Z-1's were scrapped.



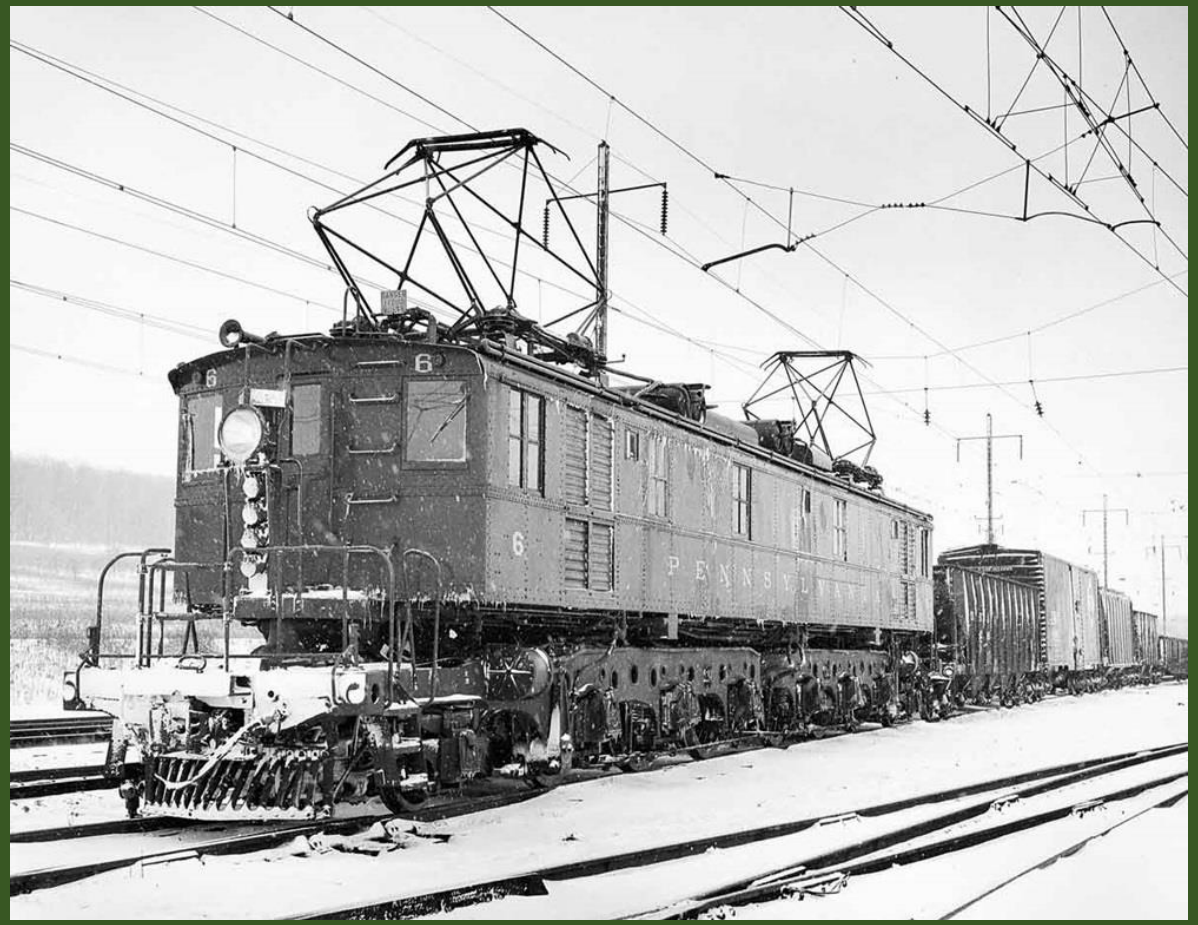
UP turbine. The ex-GN W-1 is the center unit.

GN W-1

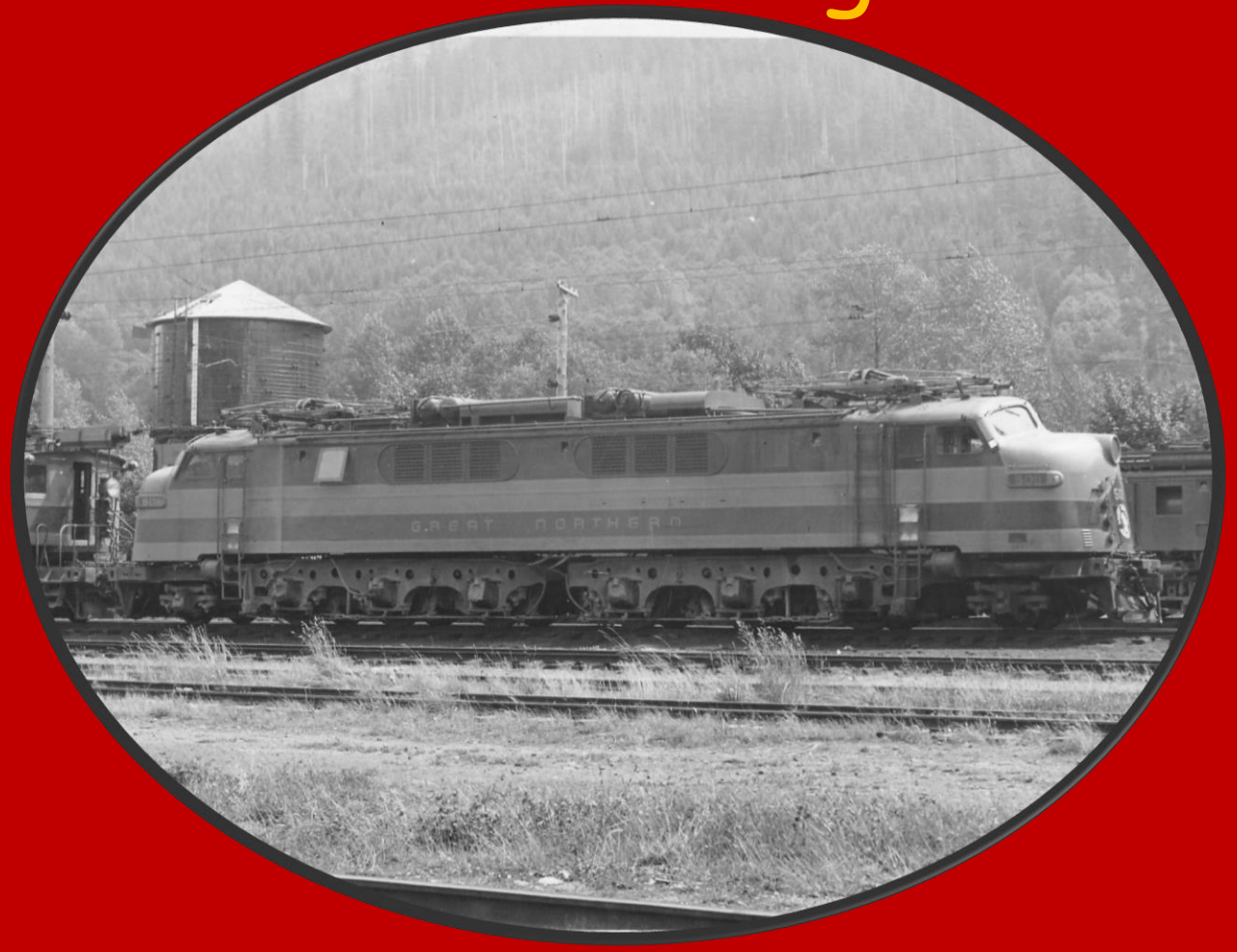
UP 8080.

Ex GN Y-1 as rebuilt by the PRR.

PRR FF2 in service. They were replaced by the new E44's in 1960.



Y-1a No. 5011 went to the PRR for spare parts. Ironically, one of its FT cabs was grafted onto a damaged PRR FP7.



How the tunnel is ventilated to remove the diesel fumes.

Ventilating fans and door on east end of tunnel.

The tunnel after dieselization. Not one trace of the electrification existed.

An attempt to promote air travel through the tunnel was even tried. The service was called “FOFC.”


CASCADE TUNNEL

BNSF present day service through the tunnel.

Between 1929 and the present, the Cascade tunnel has served the following railroads:


GREAT NORTHERN
RAILWAY


BURLINGTON
NORTHERN
RAILROAD


BNSF
SM
RAILWAY


Amtrak


GREAT NORTHERN
Rocky says, THANK YOU!
THE END