

and trestles that would be necessary in the 11 miles of Carriso Gorge the capital was raised to \$9,000,000. The section in Carriso Gorge cost \$3,939,000, an average of \$353,000 per mile.

In 1917, the Southern Pacific became a partner in the building of the S. D. & A. Their investment of \$9,000,000 raised the capital to \$18 million.

This same year work was started on the 17 tunnels and bridges necessary in Carriso Gorge.

Now, if I may, I would like to digress for the moment and tell you something about the Southern Pacific Company's training and their requirements for officers. So long as the S. P. is now a part of our railroad, this will make it clear why the officers of the S. D. & A. have been changed from time to time, as some of you may have noticed.

The S. P. has two systems, both Atlantic and Pacific, which when combined have 12,000 miles of main line. The Atlantic system extends from El Paso to New Orleans, Louisiana. The Pacific system extends from Portland, Oregon to El Paso, Texas. These systems are divided into divisions, and a division is a length of track under the supervision of a superintendent. They vary in length from 250 miles to 350 miles as conditions make it necessary.

There are 10 divisions between Portland and El Paso and the conditions vary on most of them. It is on the different divisions that these varied experiences must be had by the officers. This is a prerequisite for advancement as an official. First in order to hold the official positions higher than that of superintendent, such as Chief Operating Officer, General Manager and vice president in charge of operations, one must have had experience with the three basic elements that effect the railroad. These are the effects of intense heat, intense cold, and the effect of heavy rain. All of these experiences can be had on the 10 divisions of the Pacific system. Should an officer not had these basic experiences before reaching the superintendency of a division, he will be transferred to the various divisions to acquire the experience. This gives cause many times to the transfer of officials. In my 44 years on the S. P. I have worked on all divisions between Portland and El Paso.

Now back to the S. D. & A. Railway. In 1919, after all the grades and hard work, the last of 21 tunnels was completed. Now we had 4 tunnels in Mexico and 17 in Carriso Gorge. These tunnels varied in length from 177 feet to 2596 feet. In addition, in the 11 miles of Carriso Gorge we have 14 sidehill trestles which vary in length from 76 to 376 feet. There are 110 curves in this 11 miles that would make $10\frac{1}{2}$ complete circles.

About this same time the National City & Otay Railway, San Diego, Cuyamaca & Eastern Railway and the Coronado Railroad (1917) were acquired by the S. D. & A. Railway. These were small railroads operating in and around San Diego, some having been built as early as 1886.

That portion of the railroad in Mexico was incorporated as the Tijuana & Tecate Railway. It extends from Tijuana to Lindero, a distance of 70.9 kilometers or 43.4 miles.

The S. D. & A. was officially opened on December 1, 1919. This railroad opened with 50 miles of 1.4% grade between Redondo, Mexico and Hipass (now Tierra del Sol), the summit of which is 3660 feet above sea level, and 26 miles of 2.2% grade between Coyote Wells and Hipass. The 148 miles between San Diego and El Centro had a total of 349 curves that would make 34 complete circles. When the road opened there were on the property: 20 all wooden coaches; 2 all wooden observation cars; 2 all wooden combination cars; 26 side dump gondolas; 21 steel flat cars; 10 steel gondolas; 8 tank cars; 2 switch engines (0-6-0); 7 ten-wheelers