



UNION CARBIDE'S
TUNGSTEN
MINE IN THE SKY

UNION
CARBIDE

METALS DIVISION
Bishop, California



Advanced ore handling equipment includes diesel load-haul-dump vehicles such as this one that will pick up several tons of ore in one scoop.

The Union Carbide Metals Division's Pine Creek Mine is regarded as a modern, integrated tungsten mining and milling operation. The mine itself has been referred to as an engineering miracle. Its history can be traced back over 80 years — 80 years in which it has survived the test of natural and financial difficulties.

Over the years, the men who have taken part in this unusual and vital industrial enterprise have had to cope with everything nature could muster. Blizzards, landslides, earthquakes and floods recur throughout the history of the mine. The challenge presented by the elements have been met squarely and much has been gained from the colorful and, at times, tragic experiences which are now part of the history of the Pine Creek Mine.

The courageous spirit of these men has withstood the dark days when, shortly after mining operations were established following World War I, the bottom dropped out of the tungsten-molybdenum market. Renewed efforts to open the mine included the construction of a mill at the mine site in the twenties. The mill was no sooner completed when the regretful decision had to be made to close down the property. The mine remained dormant for almost eleven years only to go through another upsurge of activity in the mid-thirties which has been sustained to a varying degree up to the present time.

The Mining Tradition at Pine Creek

The long mining tradition at the Pine Creek Mine was established by Civil War veterans who reputedly migrated west as prospectors for gold. As a matter of fact, the first claims were located where Union Carbide's Metals Division's mill now stands. These ventures were not particularly successful since the gold content was of too low a grade to work. The search for other minerals persisted, and eventually claims for tungsten and molybdenum were located in the Morgan Lake area.

Just before the start of the First World War, the demand for tungsten and molybdenum had grown greatly. In April, 1916, four men, O.E. (Billie) Vaughn, A.E. Beauregard, C.C. Beauregard, and James Sproul, filed location notices and named their claims Blizzard 1 - 2 - 3 and 4. The claims were aptly

named since the party arrived at what was to be the Pine Creek Mine after a journey in which a blizzard almost wiped them out. They began working their claims by hand. The work was difficult and ore had to be sent down the steep trail by pack trains of mules to waiting wagons. The ore was loaded on a narrow gauge railroad and shipped south for processing.

During the latter part of 1917 and early in 1918, the claims were transferred to the Pine Creek Tungsten Company. Mining operations were discontinued in 1919 because of a slump in the tungsten market. The Tungsten Products Company took over the mine in 1923 and by 1924 had built a 125-ton mill to produce scheelite and copper concentrates. The property was closed in 1926 and remained idle for about eleven years.

On May 14, 1936, United States Vanadium Corporation, a wholly owned subsidiary of Union Carbide Corporation, acquired the property. By this time, a narrow winding dirt road had been constructed from Rock Creek Lake up over Morgan Pass by way of Morgan Lake to the mining property. USV improved the road and erected a permanent camp for employees, in addition initiating the redevelopment of the mine. The existing waterwheel-generated power to run the old mill was not of sufficient capacity to operate a larger mill which the Company contemplated building. The California Electric Power Company constructed a line up Pine Creek Canyon to the mine. This, in itself was regarded as a great feat. All poles, wire, and necessary auxiliary supplies were transported by pack string up the hill beyond Brown's Camp, at an elevation of about 7,000 feet above sea level, to the "A" Level Mine at an elevation of 10,800 feet.

Construction of a Company mill at "A" Level was completed, and the mill placed in operation on November 24, 1937. This mill was built for the recovery of tungsten. By this time, production of molybdenum from other properties in the United States had so greatly expanded that it was not profitable to operate the Pine Creek mine as a molybdenum producer. The mill operated until 1941 when it was destroyed by fire.

During this time, a small village of fifteen houses was erected at "A" Level to accommodate employees and their families. In 1938, approval of an application to the Forest Service for the

right to build a road down the Pine Creek side of Brown's Camp was obtained. This road was started in July, 1938 and completed by January, 1939. It was a dirt road, very narrow, about seven miles long and contained fifteen switchbacks, on many of which even a small car or pickup had to back up to get around the turns. In some places, the grade on this road was as much as 23 per cent. The road has since been improved and widened, and the lower portion below Brown's Camp realigned at various times during the last fifteen years.

During 1940, an experimental refinery plant was erected for the treatment of tungsten flotation concentrates from the "A" Level mine. This plant was started in September of that year, and in 1941 construction of a full-scale plant was started at Upper Scheelite (the present mill site). This plant consisted of a concentrating unit similar to that at "A" Level, and a refinery similar to the experimental plant which was built. Shortly after this plant was completed, a village of 30 houses for the accommodation of married employees and their families was built at the mouth of Gable Creek, about halfway between Upper and Lower Scheelite.

Continuous mining of the ore bodies above "A" Level, from 1936 to 1942 was rapidly depleting the known ore reserves of the property. An exploration program, using diamond drills, which originated from "A" Level indicated that the ore body extended several hundred feet below the workings on that level. A tunnel was started in early 1944 from the present site of the Zero tunnel. This tunnel was completed into the ore body in 1949. It is about one and one-half miles long.

The Impact of World War II

During World War II, the mining of tungsten developed into a healthy industry in the United States. Previous to 1940, American tungsten output was not a large part of world supply, amounting to 13 per cent of the world's production compared to 37 per cent by China and 17 per cent by Burma. One of the principal factors contributing to the growth of domestic tungsten mining industry was the development of metallurgical treatment processes such as those at Union Carbide's Pine Creek mill. This made possible the recovery of a high percentage of tungsten in relatively low-grade ore. The product produced was low in impurities and high enough in grade to meet the market specifications for normal contracts required by the tungsten consuming industry. As a result, many low-grade tungsten deposits were developed which were able to close the gap created when tungsten shipments from the Far East were cut off. By the end of the war, the United States had almost become self-sufficient in tungsten.

Post-War Activities

The Pine Creek Mine and mill were shut down in January, 1947, as a result of a shortage of manpower. The mine resumed operations in May, 1947, and the plant began processing ore in November. The following year, plans were completed and construction started on a crushing plant, auxiliary buildings at Zero tunnel level, and employee facilities. This construction was completed about the middle of 1949.

It was in February of 1949 that fire destroyed the surface plant at "A" Level. Mining at this level was completely halted, but development continued in Zero Tunnel, which became the chief entry to the mine.

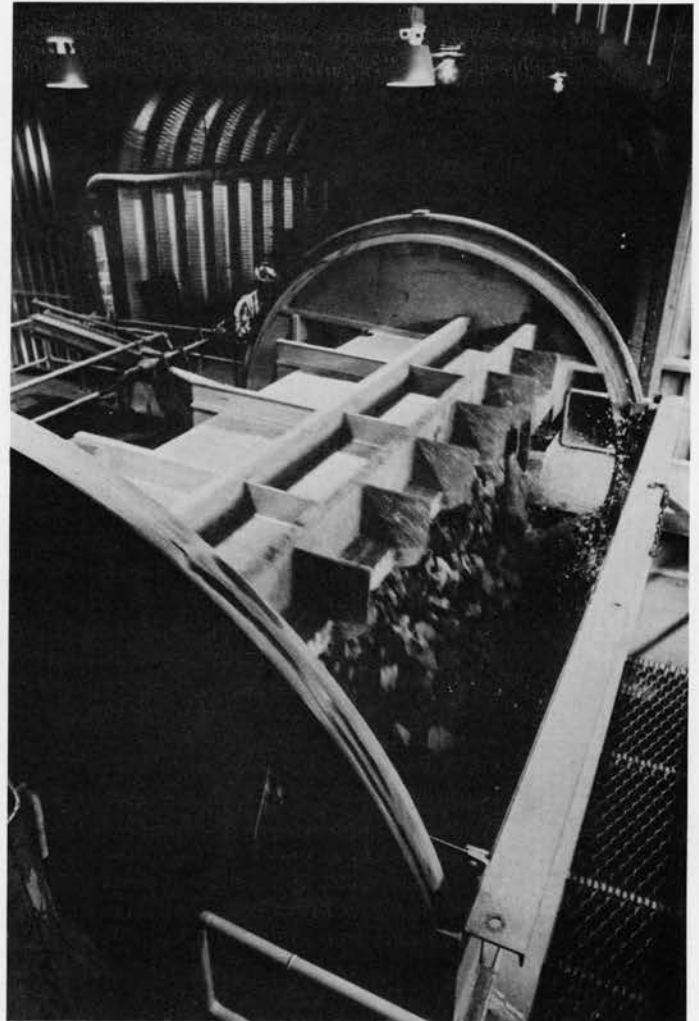
By 1951, the development of the mine made available a quantity of ore approaching that of the capacity of the mill and chemical plant. Zero Tunnel was widened and equipped.

At the outbreak of the Korean conflict, the Government's requirements for tungsten increased rapidly. A stock-piling program was instituted for this strategic material and Union Carbide's Pine Creek plant was an important contributor to this program.

Perhaps the most significant development in recent years has been the increase in the known reserves of the Pine Creek mine through Union Carbide's mine development efforts. It is believed that this mine may be the largest single known domestic tungsten deposit. To date, 15 million tons have been extracted from the Pine Creek mine.

High-Purity Tungsten Plant Completed

In late 1959, the results of developmental research and pilot plant testing became a reality with the completion of an expansion at the Pine Creek mill. The new plant addition is capable of producing large commercial quantities of tungsten in the form of a high-purity raw material, known technically as



Rotary dumper spins 11-ton ore car on the axis of its couplings, dumping ore and accumulated water without disengaging car from train. Dump bin feeds new mill-level crushing plant.

ammonium paratungstate. Ammonium paratungstate is important in the manufacture of cemented tungsten carbides and lamp filaments. The demand for this compound outstripped the capacity of the expansion and in late 1960, another addition was constructed that increased the capacity for producing ammonium paratungstate as much as 25 per cent.

The Pine Creek mine still produces molybdenum, copper concentrates, and small amounts of gold and silver in addition to tungsten. It has been a pioneer in safe mining practices; and although the weather hasn't changed much over the intervening years, the Union Carbide people at Pine Creek have learned a lot through experience so that the catastrophic hazards that existed at the turn of the century have been removed.

In 1962 work was started on the "easy-go" tunnel at an elevation of 8100 feet. This project consisted of driving a tunnel horizontally through the mountain a distance of two miles. After completion, the use of the aerial tram for movement of ore from the mine was discontinued and all ore was handled by ore trains moving through "easy-go." This project was completed in 1969 and all mining levels above the tunnel — up to an elevation of 11,500 feet dump mine ore through ore passes by gravity directly to the "easy-go" for hauling to the mill. Because of this, Bishop could be called the upside-down mine.



Flotation cell, a standard tool in mining for 50 years, here carries copper and molybdenum ore particles on bubble froth, while unwanted rock particles sink to cell bottom.

