

Copper Country

In the once forested hollows where Tennessee, Georgia and North Carolina lawyers still argue over where the state lines meet, rose a barrier of rusting hills in a grandeur that would break your heart any dawn - especially at Kawa'na, anglicized to Ducktown.¹

The Americans pushed out the Cherokees in 1836 under the New Echota Treaty, making this the Ocoee District - available to settlers at \$7.50 an acre. However, even five months after the opening date only 510 grants were settled along the Ocoee River.

In mountain-locked Ducktown, there was no rush at all.

After the price finally dropped to one dollar an acre, a few quarter sections were sold and settled. But since the livelihood for the settlers in the Ocoee District was mostly farming, the Ducktown slopes still did not attract many. It was hilly, and besides, there was discoloration to the hill soil. However, John Rogers purchased a forty-acre plot on the Ocoee. John Davis followed two months later, buying forty acres on the creek at what became Davis Mill.

Even with a mill and a ferry the rust-colored hills deterred settlement but, in 1849, attracted a scarce-of-fat rider with winkless squint, John Caldwell. He had pursued into these hills a rumor about the red soil, and he found what he hoped.

Asking for assistance from settlers in establishing a copper mine, he ran into both disbelief and indifference.

Caldwell explained the benefits.

"Civilization?" People made it clear - that was not why they had broken ankles and friendships to cross the mountains and rivers.

However, in the summer of 1843, a man simply known as Lemmons had come with that same lean, searching look. Gold was his life, and here in the hills he found a decomposed dark-colored rock in which, when crushed, he saw large rich red crystals.

His excitement was followed immediately by concern. How to carry it and hide it. Lemmons filled the sleeves of his coat, tied them with hickory withe, hid his pan, and rode back to his shelter. He drank strong waters that night with acquaintances, keeping his delicious secret. In the morning, Lemmons looked again at his find. The sheen was gone. What remained was dull umber - the red oxide of copper. Gold was what he wanted. He moved on.

The incident seemed forgotten. However, a state geologist appeared on the exact site of Lemmon's discovery and sent samples to New York for analysis.

Mostly iron, they said. One piece, however, assayed eleven percent copper. It seems everyone had thoughts only of gold.

A full beard pierced by a short pipe trudged into the valley leading a hundred dollar horse - A.J. Weaver. He took notice of Lemmon's discovery. Weaver's first love too was gold, but he was more open-minded. He began the first deliberate mining expedition in May 1847.

Weaver sent out in two lots ninety casks of ore to be analyzed.

The first assayed 32.5 percent copper. The second, 14.5 percent. Weaver sold them. But his interest was gold; he left for Mexico. Later, he started to return to his mine in Tennessee. On his way back, he got crosswise with Indians and was killed.

However, John Caldwell returned. Despite his unsuccessful appeal to the people of this district, somehow, in 1849, he managed to get a document signed by a majority of the citizens to allow the township officers to give him a mining lease on the School Section. Section 16 of each township was reserved for support of schools.

Caldwell began his work by hacking out a road to make mining possible.

Although A.J. Weaver was dead, word of his ninety-cask sale of copper-bearing ore from Ducktown had seeped eastward. The first agent of English capital seeking investment in mineral land arrived in 1849. The townspeople were now alert. The landowners had leased to Weaver knowing he lacked funds to purchase. The story was different with the Englishmen.

John Rogers' ferry had brought three of them across the river. He told John Davis at the mill, "They're offering cash, and they'll let a man keep his standing crops and keep pasture rights two years."

"How much will they pay in cash?"

"One-fourth in cash."

There must be real money in that rusted land. That first English transaction is the one most people considered the real beginning of mining in Ducktown - Cochecho Mining Company, 1852, first to receive a mining charter from the State of Tennessee for a parcel of Ducktown land.

The first rock to receive the miner's drill was gossan, honeycombed, ferruginous residue of the copper vein. Under that lay a wealth of black ore, iron and copper mingled. Running twenty to sixty percent copper, it could be cheaply and quickly smelted without complex process.

Four more companies incorporated in the district that year. In January 1859, when the legislature reconvened in Nashville, the docket was full; twenty-three more companies lined up for charter approvals.

A geologist from London studied Ducktown's potential for two months and judged the mines could pull 72,000 tons of ore a year; that is 14,400 tons of pure copper. At \$600 a ton, they could produce \$8.7 million, probably \$7 million profit.

The quiet hills exploded.

"The high percentage of some of the parcels of ore taken out created, after the first discovery of those mines," recalls Eugene Gaussoin in *The Copper Mines of Ducktown*, "one of the wildest excitements recorded in mining history."

By 1854, excitement was epidemic. The district was itching and squirming in every direction into copper boomtowns -- Ducktown, Isabella, Epworth. Population outran the surveyors, the land office records and the law.

Union Consolidated Mining Company² of Tennessee was the principal company for one reason. It was managed by an authoritative young man, Julius E. Raht, who had been mine captain at Polk County Mine and Mary's mine. Called upon to superintend Union Consolidated, his authority grew because the owners were headquartered at distant 60 Wall Street, New York.

By 1860, five hundred men and boys directly worked the copper industry in Ducktown; most others indirectly depended upon it. Copper was bringing profitable 22.88 cents a pound.

Civil war changed Ducktown, southern miners, northern owners. On November 7, 1861, the Confederacy confiscated Ducktown industries from the "alien enemies." J. E. Raht could see more coming. He was out of communication with his Yankee owners. He continued operating Union Consolidated Mining Company, the largest company in Ducktown.

It was time to leave. Folks went in any direction that brought them clearly within Union or Confederate lines.

Julius Raht made it to Cincinnati, and stayed until the war burned out.

In the spring of 1865, after Appomattox, the strongest force for getting the region back in operation socially, politically and industrially was Julius Raht.

Until 1872, men drilled by hand, for about a dollar a day, producing sweat, blisters and constant frustration when hand drills dyked in the rock and could not be lifted between blows of the hammer. In 1872, machine drills replaced hand-held.

State of the art recovery at that time, since raw Tennessee ore could not be directly smelted in any blast furnaces within local knowledge, was to roast the ore, then feed the residual mass into furnaces.

The outdoor roast heaps consisting of wood, coke and ore created, after several months, a sulfur-free residue which could then be smelted.

The men from London brought in bigger furnaces. That required larger roasting yards. That would create a serious threat later.

The fall of 1875 brought with it another civil war, this one between Julius Raht and Union Consolidated Mining ownership.

The company was financially dependent upon its hired supervisor, continuously indebted to Raht during the '60s. In 1869, their records showed a debt of \$124,596.98 to him.

In an effort to cut the cord, they sent their secretary, E. G. Duvall, to make a report about Raht. After the evaluation and Duvall's smug return to New York, Raht asked for a copy of the report.

Denied.

The report was just what the board had hoped, a contemptuous accusation that Raht was "draining the company for his own personal profit." Additionally, "His information about the mines is mainly obtained from his subordinates, as you are aware. I believe that any good, practical businessman can easily take his place."

After nearly twenty years of service, Raht fought back. Convinced he would never see Duvall's written testimony, disgusted with the inability of the board, and firmly believing he would never see the \$108,789 balance the company owed him -- he went to the courts in 1875.³

The trial was a marathon 6,000 pages of testimony, unprecedented in the Supreme Court of Tennessee.

Meanwhile, the national economy plunged. Copper prices sank. Most of the companies in Copper Basin shut down in 1878. UCMC went bankrupt. The trial continued. J. E. Raht died. The trial still continued. The company properties were sold to Francis W. Williams for \$120,000 which went to union Consolidated mining Company's creditors.

The rusty hills were silent.

The property of Raht's old Union Consolidated was bought by British investors who formed Ducktown Sulphur, Copper and Iron Co., Ltd. (DSC&I Ltd.). Their on-site managers were able men: Livingston Shugart, N. H. Emmons, and the latter's assistant, W. H. Case. Charles Gelsthorpe came from England to take charge.

No major advances to the process had been made since the early Ducktown operations. Therefore, as the Basin tried to make a comeback, it was not competitive with other copper ores in other parts of the nation for which more economical processes were known and workable. Tennessee ore still had to be roasted before entering the furnaces.

Suddenly, for the strangest reasons, some major changes would happen. The four furnaces of the DSC&I Ltd. could handle 400 tons of roasted ore daily. However, the roast yards could not supply them that much in weeks. Hence, furnace capacity was going to waste.

More important, but part of the same story, smoke damage lawsuits by downwind Georgians against the roast yards were becoming so aggressive that obviously operations might be shut down totally if roast yards could not be eliminated.

W. H. Freeland became general manager of DSC&I Ltd. in 1899 and began experimenting immediately to see if there was any way to skip the roasting step and feed the raw sulfide ores directly to blast furnaces for smelting. If this could be done, roasters could be eliminated and the industry could continue.

His answer came not by scientific research but by a seldom-acknowledged phenomenon -- luck.

Near the end of one night shift in early 1902, the head feeder on the experimental furnace, according to Barclay, "saw that the fickle furnace was slowly expiring." It was not working on the unroasted ore. Noticing that he had a sizeable pile of quartz left over, he casually shoveled it into the furnace, closed the door and went home. When the day shift arrived, the furnace was, much to their surprise, "reviving with vigor".

"Following the regular feed chart, the new shift introduced the usual prescribed small charge of quartz, and noticed the furnace again slowing down."

Upon the head feeder's return to work that night, he heard the story of what had happened. Remembering the extra quartz he had thrown in near the end of the shift, he did the same thing again at the end of this shift. Again, the same result.

"On the third of these memorable shifts, the now thoroughly alerted head feeder started off the shift by throwing out the feed chart and adding additional quartz to each charge throughout the night, reducing the amount of ore by that same quantity.

"The furnace continued to run smoothly -- this was it! A new era and a new industry had come to the Ducktown Basin."

As a result pyritic smelting was perfected; and, on October 5, 1903, DSC&I Ltd. discontinued roast ovens. The company made a big forward step for the Basin.

While there was a family feel among the companies in the Basin, there was also sharp competition; companies kept close tabs on each other. Witness this excerpt from W. H. Freeland of DSC&I, writing about Tennessee Copper to his boss in England:

"Our neighbors got their third furnace into commission last week (on cinder). A week earlier they made a 24-hour run on green ore, putting through 350 tons, but secured no appreciable concentration. They have postponed further trials until . . . It is their intention to make the transition from cinder to green ore very gradually, so it is probable they will . . . I mention this for its bearing on the smoke question."

"Elimination of the roast ovens did not eliminate or even lessen the output of sulfur smoke from the furnaces," explains Barclay. "The volume and concentrated strength of the gas was increased. However, instead of the smoke rolling lazily from roast sheds and settling in huge palls over the near landscape, it was now funneled from the furnace into smokestacks.

"From these tall chimneys the smoke was dispersed far and wide," attracting lawsuits now from a much larger reach of geography.

Georgia got a decree forbidding Tennessee to send its smoke south. Four new furnaces were then building in Copper Basin. Georgia got a restraining order.

Lawyers scoured the country looking for wilted crop leaves. Filing lawsuits against the copper companies became a regional way of life and form of pension income. The copper companies would be either bled to death or outlawed if a solution could not be found.

The only way the sulfurous gas could be eliminated was by condensing it into sulfuric acid. Therefore, four companies went to work building sulfuric acid plants.

The Tennessee Copper Company began building a chamber acid plant in 1906; in 1908, the Isabella Company did the same. DSC&I, Ltd. built one in 1907 and another in 1929. But the point of all this is that in saving itself from death by smoke damage suits, the Copper Basin found itself a new major cash crop, sulfuric acid.

At that time, none could guess that the blast furnace itself was about to phase out. As ore leaned down, the blast furnace was less effective. A flotation process would come in to recover the metal from leaner ores. In this process the material is ground fine, mixed with water and run through a series of flotation chambers where various reagents float off in foam the different elements in the ore, including iron and copper.

Every company went through a similar process evolution on different time schedules.

To this point the copper industry was divided among several small towns: Ducktown, Isabella, Hiwassee, and others. But it came to center in Copperhill.

It tells something to know how Copperhill was born. Harbert C. McCay was a man with land sense. The McCay farm on the Tennessee side of the line at a narrow point on the river was ideal for the McCay ferry. Across the river was equally shrewd Aaron Mathews. They alternated months operating the ferry and earning tolls.

McCay's farm was also ideal for a flag station for the Marietta and North Georgia Railroad where it met the Knoxville Southern. A railroad construction camp sprang up there, so it was logical for McCay's Commissary to open up, and later McCay's post office, Harbert C. McCay, postmaster. The post office soon needed larger quarters. So it rented space from the newly built McCay Building.

McCay could not persuade Matthews to sell him some land, nor vice versa. Therefore, McCay had to sell off some of his own farm for home sites for the railroad people who would buy goods from McCay's Store.

When, in 1899, Tennessee Copper erected its large smelting works near McCay's farm, the business center of gravity of the Basin began shifting there. Harbert McCay made Aaron Mathews another offer for part of his farm. Mathews declined, and separately they sold small pieces of land to provide dwellings for the influx of smelters.

The McCays and Mathews were interested in the full-fledged development of the area; hence, beyond the commercial, there was strong civic action on their parts. The McCay's Baptist Church was built, and Elmer C. McCay became secretary of the Methodist Sunday School.

Two remodeled boxcars were joined opposite McCay's Store, creating McCay's railroad station. The ferry became too slow for the traffic and a swinging footbridge was strung over the river. Children needed education. A school was opened in the back of McCay's Commissary. A bank was needed, so the Polk County Bank of McCay's was chartered, Mrs. M. E. McCay among the charterers.

The town of McCay's, for that is what you'd have to call it now, was hit by a disastrous fire leveling fifty buildings, followed by a flood, waist deep in the hotel lobby.

With the clean up and rebuilding came a name change. The Tennessee Copper Company had established its address on arrival here as Copperhill, because the post office they had been using was called Copperhill. Now, by agreement among the people, the copper company and the railroads, the name of the rebuilt town was changed to Copperhill, Tennessee.

Tennessee Copper's⁴ first long-range planning program began in 1920 with a newly appointed general manager, S. H. Houser, whose impact on Copper Basin would match that of Captain Raht, augmented by more concern for the people and more affection for them. Houser started what he called the All-Milling Program, a strategy for progressively eliminating the blast furnaces as key to recovery of copper and iron.

It was a program of unprecedented scope, requiring several millions of dollars, to rebuild the plants. Houser was young enough not to be shaken by such a massive project and shrewd enough to see that as the grade of ore lowered, the blast furnace efficiency would drop.

He sold the idea to New York management; but when the plan was young, the post WWI Depression hit, delaying until 1923 implementation of the construction of a flotation plant at the London mine; followed in a year by four roasters and a sintering plant at Copperhill.

That was only part of the plan, but it led to two new merchantable products - iron sinter and zinc concentrate.

The company was halfway in the All-Milling Program when the Depression of the 1930s blew it down. However, Houser was not only a starter but a finisher. The program resumed, giving the company the stability of product diversification - copper, various acid grades, iron sinter, copper sulfate, fungicides, insecticides, zinc concentrate, sodium hydroxide and ferric sulfate.

From Isabella mine the ore traveled by belt to the flotation plant where the copper was recovered while another concentrate heavily laden with iron and sulfur traveled by conveyor to the roasters. From the roasters the material (iron calcine) passed to the adjoining sinter plant, emerging as sinter. Meanwhile, from the roasters the high content sulfur gas traveled through flues into acid plants to become sulfuric acid.

Thus, from the mine hoist the ore was broken down into: iron, sulfuric acid and copper. Other companies could not duplicate this efficient process because their mines were too widely separated.

What happened to all these companies?

The Ducktown Sulphur, Copper & Iron Company was being killed because it was locked into a wartime contract to supply sulphuric acid at pre-inflation price. The only way it could solve the problem was to cease to be. Therefore in 1925, Ducktown Chemical & Iron took over the assets of the English controlled Ducktown Sulphur, Copper & Iron Company, Ltd., which was in receivership. The DC&I weathered the panic of the 1930s only to face large capital repair needs.

That's when it was taken over by Tennessee Copper at 11:00a.m. August 31, 1936. Tennessee retained all the DC&I people and made little change in operation.

Labor in the Basin had some unusual aspects. For one thing, just as young J.N. Houser⁵ came on duty before World War I, a young union was being born in the Basin. To the surprise of many who didn't know Houser (who came from a zinc company in Mascot, Tennessee), he publicly expressed around town his approval of unions and his opinion about the justification for their existence. In that friendly atmosphere the young union perished. People said of its demise, "Houser loved it to death."

Even so a very high impact strike did cripple the Basin in 1939, coming about in this strange way. Unionism did catch on vigorously during and after the Depression. But the strike was caused not by hostility toward the companies but between the AFL and CIO.

Tennessee Copper Company in 1936 stepped up a logical acquisition and product expansion program, which had begun in 1920⁶ and continued to 1950.

By 1950, the hills that attracted the likes of John Rogers and John Davis were denuded, scarred, paved and unlovely. A drive was launched by Tennessee Copper to reforest. The huge copper complex dominated what had once seemed indomitable hills.

The process has grown infinitely complex as more products were sought from decreasing copper content in the ores. Yet the basic steps, even as late as today, remain much the same.⁷

In August of 1960, W.K. Stover and Almer Robert, working a three-machine, hydraulically operated, jumbo drilling machine, finished driving a 6,000-foot-long tunnel from an existing Tennessee Copper mine. They needed to connect exactly at the tenth level with the shaft, which had been sunk into Tennessee's newest mine. That newest mine was the area known as School Property, first leased to John Caldwell in 1849 by the township officials. That property is now leased by the township to Tennessee Copper.

Stover and Robert pulled out their drills on August 23, 1960. Mining engineer G.G. Kopp studied the rock face and nodded. Sam Craig, general mine foreman, motioned the blasting crew in. The blast-through dropped a pile of rubble, and the men were staring right through the hole into the shaft. They had hit it on the nose.

They were not at that moment aware they were standing just ten levels below the very place where John Caldwell started the whole thing on the School Section.

Tennessee Copper⁸ was the inheritor of all the companies we've discussed and the families who worked these mines since J.A. Weaver came to Copper Basin in 1849.

"But in the spring of 1962 a different atmosphere was felt," records the veteran chief clerk of the Tennessee Corporation. "Ominous whisperings were being heard. It seemed that someone was waiting to buy Tennessee Corporation."

So? Thousands of men in the '60s were feeling these "ominous whisperings" as a new wave of acquisition hunting swept American industry with its benefits and hazards.

But the hills of Tennessee are something else.

The homing pull of the Tennessee mountains on its natives is mystic and powerful. It is a quite well documented demographic phenomenon that after men go out into the world from the Tennessee villages to make their fortunes, they come back to stay. It has also been noted that natives tolerate people coming into Tennessee hills to visit but not to stay.

The Tennessee Copper Company, later subsidiary of the Tennessee Corporation, entered the 1960s shipping eighty carloads per day of product and was rated one of the most profitable middle-sized companies in the country. But note the tone of the June 10, 1963, entry in the diary of the Tennessee Copper chief clerk:

"Letter received from our N.Y. office today said Cities Service - Tennessee deal took effect May 31 and take-over will be June 14."

The diary writer at that point had little knowledge of the big oil company in New York, but deep knowledge of southeast Tennessee. He also knew that Tennessee Copper was the great, great grandson of a dozen pioneer copper companies. He wondered if the oil company knew and respected that saga.

The Legacy continues

Continuing the legacy established by Cities Service, Glenn Springs Holdings and its parent company Occidental Petroleum Corporation (Occidental Petroleum Corporation acquired Cities Service in 1983) have, in fact, recognized and honored those first adventuresome souls. Glenn Springs is keenly aware of the mystical and powerful pull of the hills of southeast Tennessee so treasured by their long-time inhabitants. Within that framework of history and respect, Glenn Springs Holdings proudly carries out its commitment to restore and reclaim the lands encompassed by the Copper Basin Project.

Notes

¹A detailed account of the events which follow can be found in the works of R. E. Barclay, *Copper Basin and Ducktown-Back in Raht's Time*. The University of North Carolina Press. Mr. Barclay wrote from firsthand knowledge as an employee of Tennessee Corporation and antecedent companies.

²Union Consolidated Mining initially owned five mines in the district: East Tennessee, Isabella, Mary's, Callaway and Cherokee.

³J. E. Raht vs. The Union Consolidated Mining Company of Tennessee; countersuit: The Union Consolidated Mining vs. J. E. Raht.

⁴Tennessee Copper was one of nine subsidiaries of the Tennessee Corporation.

⁵Houser died with his boots on in 1949; his tour of duty did as much for Copper Basin as Raht's long career.

⁶Companies embodied in Tennessee Copper by 1935 included Southern Agricultural Tank Line; Capital Fertilizer; Calumet Fertilizer; U.S. Phosphoric Products. The principal products of the combine by 1926 were copper, sulfuric acid, iron sinter, copper sulphate, slag, phosphates and mixed fertilizers.

⁷Ore is mined by drilling and blasting, loading and hauling, crushing and hoisting to the surface. On the surface by rail to flotation mill. In the flotation plant, the ore goes in water suspension through the filtration chambers under agitation. Various chemical reagents cause different minerals to separate from the gangue in such a way that they can be scraped off in the froth at different stages. Coming off at different chambers are copper, iron, zinc sulfides. These are dried, filtered, and temporarily stored in bins.

Waste products sink and are pumped to the tailings pond.

Copper and iron concentrates travel to smelting. Zinc concentrate is sold to zinc smelters.

The copper is smelted in a coal-fired reverberatory furnace (heat reflected from walls to roof).

Molten copper concentrate is tapped into ten-ton steel pots and pours into a brick-lined Pierce-Smith Converter which blows through a tornado of air burning out sulfur, producing sulfur dioxide gas which goes by flue to the acid plant to make sulfuric acid. From the heat in the converter, other impurities combine with silica forming slag. The slag rises to the top of the molten copper, is skimmed off and transferred to another furnace where some residual copper settles out of it. The slag is granulated by being poured into a stream of cold water.

Meanwhile, the air is kept on the copper sulfide until most of the sulfur is out of it. The product is blister copper, ninety-nine percent pure, poured into 350-pound rectangular pigs or into shot copper for use in the copper sulfate plant.

The iron sulfide from flotation goes to a roasting furnace. Blasted with air, large quantities of sulfur dioxide gas form, conveyed to the acid plant. The roasted concentrate, meanwhile, is flumed with water, dried and transferred to sintering plants. Moving along a traveling grate, the particles fuse into lumps. The result is a hard sponge iron sinter, sixty-eight to seventy percent iron, sold for steelmaking.

The sulfur dioxide gases given off contain a lot of iron oxide dust which is removed before the gases are converted to sulfuric acid. This retrieved dust is treated to manufacture hydrated ferric sulfate which is merchantable.

Sulfuric acid manufacture varies with the strengths desired, ranging from seventy-eight percent to the oleums, the fuming acids that will eat clouds out of the sky. These are handled in lead chambers.

Liquid sulfur dioxide is made by compressing sulfur dioxide gas. It is used in many ways by industry - for example, bleaching textiles, extracting oils from natural products, preserving foods.

Copper sulfate, beautiful blue crystals, made from shot copper dissolved in sulfuric acid, has a hundred uses, including fungus control in agriculture.

From all these basic products come many other derivatives.

⁸Personnel: Entering the 1960s, the Tennessee Copper Company president was T. A. Mitchell; general manager, R. R. Burns; general superintendent, Lamar Weaver. The five active mines were Eureka, Boyd, Callaway, Mary-Polk County, Cherokee. The mining department was superintended by H. F. Kendall. Other manufacturing departments were: Milling, F. M. Lewis; Smelting, W. Y. Queery; Acid, M. E. Gray; Railroad, R. W. Parker; Engineering, H. B. Henegar; Chemical Engineering, E. M. Jones.

The parent company, Tennessee Corporation, had two operating divisions: Tennessee Copper Company at Copperhill and U.S. Phosphoric Products Division. It had three other subsidiary companies: Capital Fertilizer Company in Montgomery and Decatur, Alabama; New Haven Copper Co., Seymour, Connecticut; Tencor Trading Corporation for warehousing fertilizer in Illinois and Minnesota. The corporate office remained at 61 Broadway, New York.

The corporation marketed variations of thirty basic products, most of them derivative from copper.