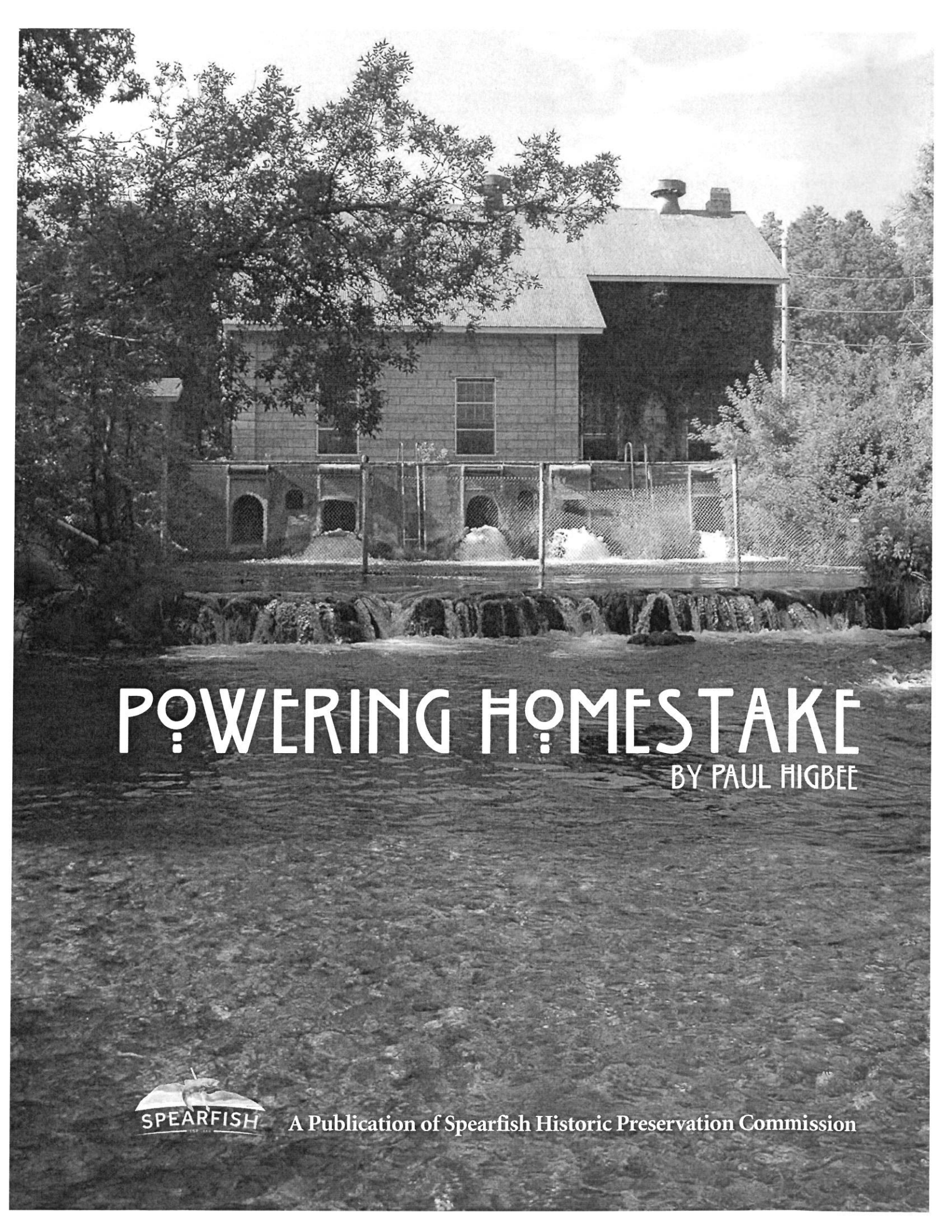




POWERING HOMESTAKE

BY PAUL HIGBEE



A Publication of Spearfish Historic Preservation Commission

POWERING HOMESTAKE

Acknowledgments

State Historic Preservation Office – South Dakota Historical Society
Spearfish Area Historical Society
Homestake Adams Research and Cultural Center / Deadwood History, Inc.
Black Hills State University Leland D. Case Library
Mr. Gary Lillihaug – Hydroelectric Plant Superintendent

The Historic Preservation Commission would also like to extend our sincere appreciation to Mr. Paul Higbee for his outstanding work on this publication.

Not only did he do an exceptional job on the text, but his experience in publishing also proved invaluable in all areas of the project.

We are very proud of the final product, and Paul should be as well.

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Author's Acknowledgments

Thank you to former Homestake employees who generously made time to answer my questions. They included Don Howe, Jerry Krambeck (who was also Spearfish mayor at a key juncture), Gary Lillehaug, Mike Overby, and Mark Zwaschka. Richard Blackstone's first-hand report, *The Hydro-Electric Plant of the Homestake Mining Co.*, published July 4, 1914 in the *Mining and Engineering World* journal, was invaluable. It would have been impossible for me to write this account without reading century-old news articles from Spearfish's longtime weekly paper, the *Queen City Mail*. The following issues were central to my research: July 22, 1908; April 7, 1909; June 2, 1909; August 4, 1909; December 1, 1909; January 12, 1910; and May 15, 1912 (which included the *Haydon-Stone Weekly Market Letter* quote). Two books I read and highly recommend are *Nuggets to Neutrinos: The Homestake Story* by Steven T. Mitchell (2009), and *The Treasure of Homestake Gold* by Mildred Fielder (1970). I first learned about Sidney Case from Jessie Case Litchewski, his daughter and my teacher in the Spearfish public school system. I'm happy that Jessie wrote a short biography of her father that appears in the Lawrence County Historical Society book, *Some History of Lawrence County* (1981). Black Hills historians Dr. David Wolff and Wayne Paananen read this in draft form and offered excellent suggestions. Finally, I am grateful that the Spearfish Historic Preservation Commission asked me to tackle this fascinating project.

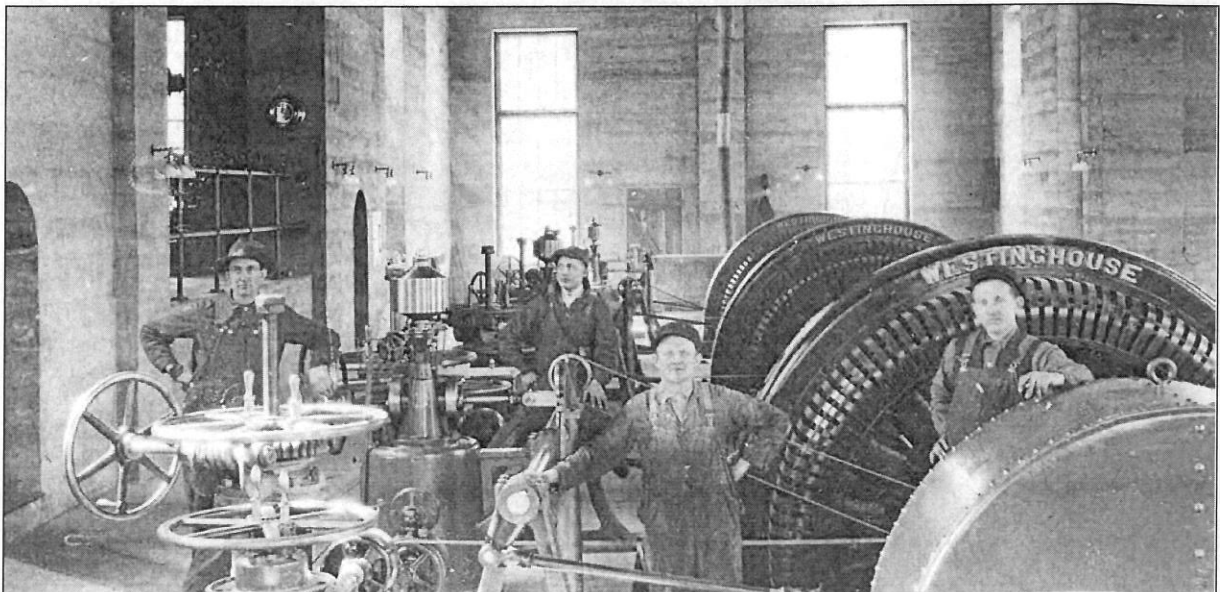
—Paul Higbee

POWERING HOMESTAKE

THE SOUNDS OF A BUSY SMALL CITY FADE QUICKLY AS YOU WALK UPSTREAM from Spearfish's commercial district, through its city park and old federal fish hatchery grounds, and along its creek toward Spearfish Canyon. Spearfish Creek's rushing waters drown all competing noise for a while. Then you become conscious of a constant hum, the spinning of great turbines, and within a couple minutes that sound overpowers the water's noise. Slowly, through thick creekside foliage, the shape of a century-old, poured-concrete industrial building emerges. It's the source of the hum, and since its completion in 1912 it's usually been called simply Hydro No. 1.

This plant transforms the creek's mighty power into electricity. Beyond that function it symbolizes a remarkable aspect of the Black Hills gold rush. Too often that rush is thought of as just one in a series of boom and bust episodes that played out across the American West in the 1800s, colorful yet fleeting. But the 1875 - 1876 Black Hills rush spawned Homestake Gold Mine, an enterprise that dug into a deep ore formation and had the resources to apply the world's most advanced engineering and technology. Homestake built Hydro No. 1 to generate electricity and transform the mine. The mine grew into an enterprise that kept South Dakota number one among gold-producing states for decades, and it survived for 125 years, 1876 - 2001.

When the plant began producing electricity in the spring of 1912, Americans intrigued by evolving industrial technologies and what they foreshadowed, found Hydro No. 1's story as significant as the mine's gold production. Could it be true that direct-drive, steam-powered motors that annually cost \$65 per horsepower to operate could be replaced by electrical power costing just \$11 per horsepower, as Homestake claimed? In



The system that fired up in 1912 is still running.

New York, the highly regarded *Haydon, Stone Weekly Market Letter* reported Homestake would “dispense with the use of coal, itself a heavy cost item, and will be free of the worries incident to future coal strikes.” The same publication marveled that the Spearfish plant was constructed from current company earnings, with “not one dollar of new financing required.”

To put things in historical perspective, Hydro No. 1 began producing electricity in April, 1912 – the same month the Titanic made its maiden voyage. There were other parallels between the power plant and ocean liner, as well. Both had the attention of far-flung observers because they were viewed as pioneering technological wonders. Construction of each began in early 1909. But three Aprils later, as the Titanic sank into the Atlantic’s depths, Hydro No. 1’s technology fired up flawlessly, so much so that the same generators were still producing electricity more than a century later.

Spearfish Creek doesn’t rank among South Dakota’s big rivers – the Missouri, James, and a few others. But length and water volume aren’t the only measures of a stream. While Spearfish Creek runs only 40 miles, from a source high in the Black Hills near O’Neil Pass to a spot north of Spearfish where it joins the Redwater

River, it drops 3,000 vertical feet. The drop translated to enough power to cut Spearfish Canyon and to make the creek a terrifying force during flood conditions. Except when it floods, Spearfish Creek runs clear. It is icy cold even on the hottest summer days. Early European explorers found the creek so vibrant and reliable that they referred to it as Spear Fish River, distinguishing it from some other Black



Spearfish Creek in 1909, the year diversion work began.

Hills streams that were mere trickles by late summer. Stories these visitors heard about the Lakota people and other native peoples spearing fish – dace and suckers – gave the stream its name.

As the 1870s dawned, the Lakota people could feel secure in the Black Hills, granted to them by the Fort Laramie Treaty of 1868. In 1874 a federal expedition led by Lieutenant Colonel George Custer discovered gold in the Black Hills. Gold rushers swarmed to the Hills in such numbers that government leaders in Washington, D.C. finally declared they couldn’t stop them. Given the fact that the United States was trying to pull out of a financial depression at the time, and that a major gold strike would help, there’s doubt among historians as to whether federal leaders truly wanted to keep prospectors away. In 1875 and 1876 gold seekers arrived in the Black Hills from all directions, and many of the best came from the West. They were veterans of earlier rushes in California, Colorado and Montana.

Brothers Fred and Moses Manuel came from the Montana gold fields in 1875. The Manuels and their prospecting partner, Hank Harney, staked the claim that became Homestake Gold Mine a mile above sea level and three miles up rocky gulches from Deadwood – up where the town of Lead would take form. The Manuels and Harney gave no thought to the emerging power called electricity, but they did put water to work crushing ore. By wagon they hauled ore to Whitewood Creek, where an arrastra powered by a 14-foot waterwheel pulverized gold-bearing rock. Within a few months they had \$5,000 in gold, and a bigger payday soon came their way. George Hearst, a future U.S. Senator from California and the founding force behind the vast Hearst family fortune, bought the mine in 1877 for \$70,000. He incorporated Homestake Mining Company at San Francisco in 1878 and had it on the New York Stock Exchange in 1879. Meanwhile in 1879, Thomas Edison was making big headlines for advances in practical electrical technology. That November Hearst's mine superintendent first wrote Edison to express Homestake's interest. Hearst bought out neighboring Black Hills gold mines, made them part of his operation, and began pumping big money into Homestake. He was committed to top-quality equipment that would set his mine apart from others across the West. By 1880 Homestake had nearly 300 miners on payroll, along with other laborers who worked in ore mills, cut timber, and performed other company services.

Early in its history Homestake began diverting water from Spearfish Creek's headwaters for its mills and also for drinking water in fast-growing Lead. Toward the other end of the creek, farmers immediately north of Spearfish kept wary eyes open, watching for anyone who might tap into the water source vital to their expanding crop lands. In 1897 Deadwood residents decided a pipe into Spearfish Creek could help alleviate a community water shortage. Spearfish farmers sent word that pipeline workers would be met by a party armed with picks and pitchforks. Deadwood dropped its plans. Fights over water rights were common in the Black Hills then, even among irrigators who developed and shared the same ditch. But using water to generate electricity, very much on the minds of Black Hills people in the 1890s, seemed to trigger less dispute than water systems for crops, livestock and human consumption. After all, water for hydro-electric plants would flow directly back into the stream, although there would be disruption above the plant where water was diverted to maximize its force when it hit water wheels.

By no means was Hydro No. 1 Spearfish's first experience with generating electricity. With little controversy the first Spearfish Creek power plant – that of the Spearfish Electric Light and Power Company – was built in 1893, two-and-a-half miles south of Spearfish in the canyon. G. C. Favorite was chief electrician. The company supplied both commercial and residential customers in Spearfish, thanks to investments by Chicago capitalists. It's possible these out-of-state investors also hoped for profits from proposed Spearfish Canyon mines and mills, operations that planned to apply new technologies for extracting gold and other precious metals from low-grade ore. Those mines didn't develop anywhere near to the extent that speculators hoped, but the Spearfish Electric Light and Power Company became a staple of Spearfish life.

Then in 1894 Spearfish's Henry Keets announced an impressive hydroelectric project to be based on the Redwater River, seven miles north of town. The Black Hills Traction Company would generate electricity to power an inter-city trolley connecting Spearfish, Belle Fourche, St. Onge, Whitewood and Deadwood. Newspaperman and early state legislator Richard Hughes was asked to negotiate land and water rights with property owners along the river. He later wrote, "When it is considered that the course of the proposed canal lay through alfalfa fields, farm gardens and orchards, it is surprising it was accomplished with comparative ease, little or no friction, and entirely without a resort to litigation or condemnation proceedings." Though the trolley never came to fruition, the Redwater plant was eventually built and

generated electricity for five decades. Some of its power, in fact, made possible early electrification of a Homestake ore mill. Central to the Redwater plant's function, and to that of most other early Black Hills hydro-electric systems, was a Pelton water wheel. Californian Lester Pelton invented the wheel in the 1870s especially for small mountain streams common to the West. The wheels were engineered to draw energy from a stream's rapid movement, more so than from water weight.

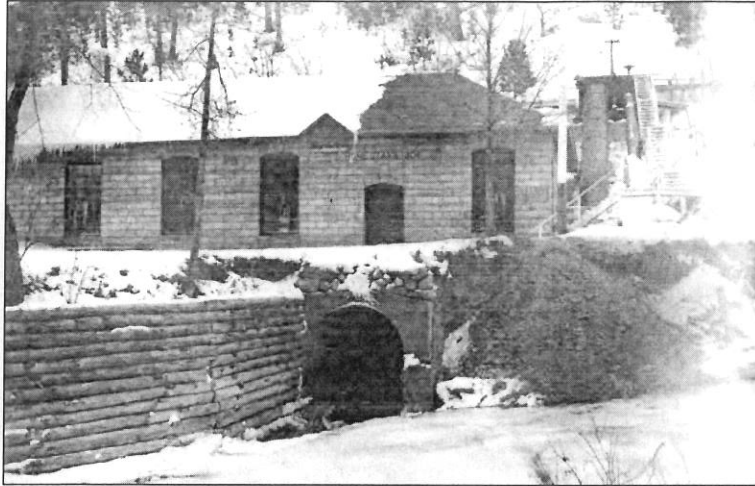
THOUGH THE ATTRIBUTE IS OFTEN IGNORED BY STORYTELLERS, the Black Hills frontier was technically advanced from the very beginning. Deadwood was linked to the outside world by telegraph in December, 1876 – two months before the government declared the Hills open to legal settlement. French nobleman and author Edmond de Mandat-Grancey visited in 1883 and reported Black Hills communities were connected by telephone service. No one in the 1880s and 1890s demonstrated more interest in industrial technology than Homestake, experimenting with mechanical drills, compressed air power, cyanidation, and metallurgy. And on Christmas Eve, 1888, Homestake publicly demonstrated its belief in electricity. To an appreciative crowd of shoppers it lit up its company store in Lead with electric lights, thanks to a small generator just purchased from Edison United Manufacturing of New York.

Homestake employment reached 1,500 in the 1890s, and a portion of those workers came to the Black Hills because they hoped to establish themselves in high-tech professions. Homestake workers hailed from across the United States and beyond, including mining and industrial sections of Europe. Lead became the most cosmopolitan community in South Dakota history, with residential neighborhoods where dialects, foods and traditions reflected Italian, Irish, Finnish, Slavic, English, Dutch and other national origins.

Sidney Case was American-born, a young man who grew up in Pennsylvania and came west to the Black Hills in hopes of working as an electrician. He arrived in Spearfish in 1898, age 22, and was hired by Spearfish Electric Light and Power. The job came with housing – a one-room cabin in Spearfish Canyon near the power plant. He and his wife Rose were joined by a son in 1902. By then Sidney was a Homestake man. The mining company was aggressively buying land in the canyon, and it also bought the Spearfish Electric Light and Power Company. The plant continued selling electricity to Spearfish customers and retained its original name, and Sidney lived in the same cabin and did essentially the same work.

But it was apparent to some observers that Homestake had plans in the works, something involving Spearfish Canyon or Spearfish Creek, or both. Spearfish Valley farmers, thinking of their water, were the first to express alarm. They knew the mine had engineering expertise that would allow it to divert water anywhere the company saw a need. What's more, a short excursion to Deadwood and Lead offered a lesson about what water exiting mining operations could look like. In 1881 Homestake won rights in territorial court to dump sand tailings into Gold Run and Whitewood creeks, and now the streams ran gray, unlike anything a farmer wanted to see running through his fields. Still, Homestake insisted, there was nothing poisonous in that dirty water.

Farmers came to understand South Dakota courts usually favored mines over agriculture when it came to water rights. Often that was because Homestake's early operations and incorporation pre-dated downstream farms, ranches and towns. At other times it was because Homestake's skilled lawyers presented compelling arguments that made judges look at old assumptions in new ways. For example, traditionally the amount of water a user could take from a stream was tied directly to the section of property through which the water flowed. Homestake lawyers argued, and judges up to the South Dakota Supreme Court agreed, that if a company owned several parcels of property up and down a stream, that the accumulated



Second Spearfish Electric Light and Power Plant

ownership could be figured into the formula used to determine how much water could be drawn from any one point. That ruling, combined with Homestake's acquisition of most of Spearfish Canyon's creekside land, gave the company tremendous control of the creek.

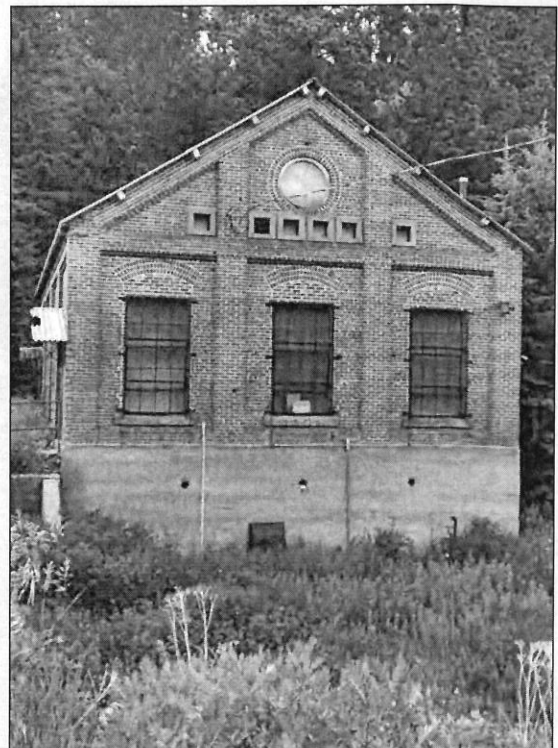
Still, when it flooded, Spearfish Creek proved it remained its own master. In 1904 its raging waters wiped out the Spearfish Electric Light and Power

plant's interior and destroyed the cabin Sidney and Rose Case called home. They grabbed their two-year-old son and escaped with their lives by scrambling up the canyon's steep sides and around Spearfish Mountain to safety. Sidney still had a job because Homestake announced it would immediately build a new plant at the canyon's mouth, closer to Spearfish. Within five years this plant would play a key role in developing a much bigger and sophisticated plant: Hydro No. 1.

IN THE VERY EARLY YEARS OF THE 20TH CENTURY most people, if asked why a mine might want electricity, would have quickly replied: "Light!" Indeed, with Homestake shafts of the era dropping more than 1,000 feet, and connecting to a system of horizontal passages called drifts that extended for miles, there was a lot of darkness to conquer. But Thomas Grier, mine superintendent from 1884 until 1914, knew he could adequately light the mine and mills with small generators similar to those that lit the company store. What he had in mind after the turn of the century was an entirely new power source replacing costly coal-fired steam engines in company mills. Some associates expressed doubt that electricity could possibly



Thomas Grier



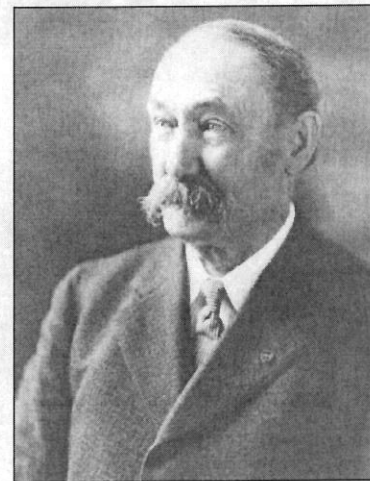
Englewood Hydro

generate enough muscle to crush ore, but Grier proved it could when he built a small prototype hydro-electric plant at Englewood, four miles south of Lead, and ran lines to two company mills.

Among mine superintendents in the West, Grier was unusual in that he didn't have hands-on mining experience or a formal mining education. A natural leader with a strong mind for business, this native Canadian began his long Homestake tenure by working as a company telegraph operator. He learned all aspects of mining, milling, and gold recovery on the job, becoming the most visionary and significant superintendent in Homestake history. To the company's benefit, Grier never lost the fascination he held as a telegrapher for sending electrical pulses over a wire, and for stringing miles of cable cross-country.

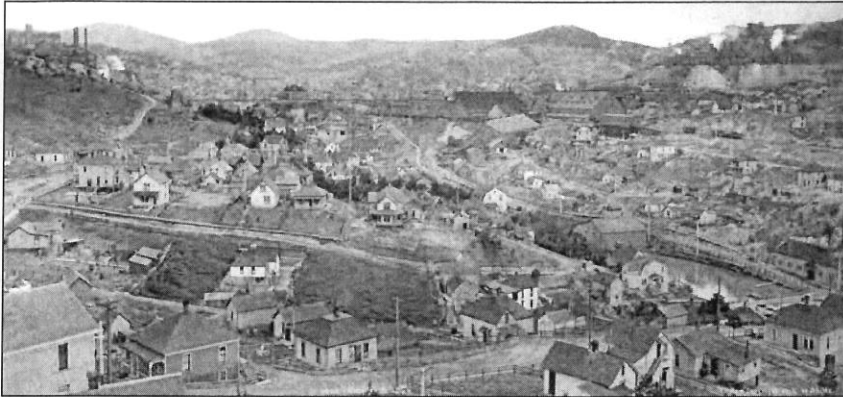
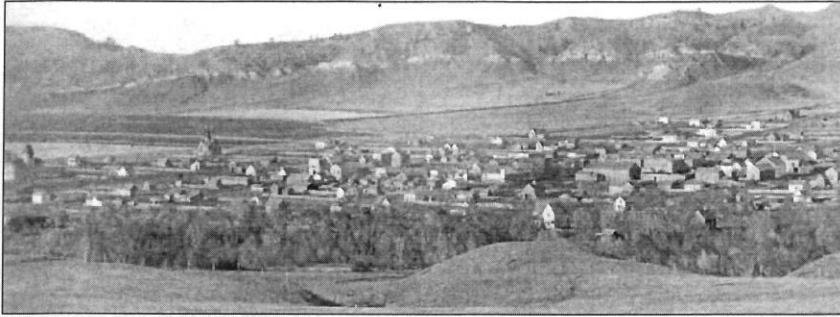
Grier had to regularly report to the Homestake board of directors about how much gold he believed remained in the mine. As the company approached its 30th year, he could confidently say no end was in sight. That was good news, vital for the board as it considered capital improvements. But there was plenty of bad news for Homestake soon after the turn of the century, too. In 1906 the great San Francisco earthquake and fire destroyed some Homestake property there, including documents about South Dakota operations. In 1907 another fire, this one in the mine's depths, broke out. Pine timbers for bracing the drifts were fuel, as was everything workers used in underground workshops, and feed for underground draft horses and mules. After attempts to extinguish the flames with fire hoses and infusions of steam failed, Grier decided to flood the mine. Between the fire, flooding, and then hoisting water out, three months of work were lost. Company revenues for 1907 were cut in half. On top of everything else, there was labor strife. In 1907 miners negotiated an agreement with Grier that reduced daily work hours from ten to eight, seven days a week, but another nagging labor issue would soon turn ugly.

Remarkably, just when it might be assumed that Grier and the board had their hands completely full with earthquake, fire and labor problems, Homestake committed fully to the Spearfish Creek hydro-electric project. It would be a supreme test for engineers, electricians, and for laborers who would tunnel through miles of solid rock to divert creek water into the system. Grier took stock of his company lieutenants and decided Richard Blackstone, a man well into his sixties, should lead the hydro charge. A veteran of the Civil War, Blackstone proved himself tireless, resourceful and a figure who commanded respect in service to the Union Army. He rose quickly from private to captain, and was sometimes referred to as Captain Blackstone later in civilian life. After the war he studied civil engineering and found plenty of applications for that training when he moved west, especially in mining regions. Blackstone came to the Black Hills in 1878 and joined Homestake in 1880. He was a major part of the Homestake subsidiary that built the first railroad tracks through the Black Hills, winding through gulches and along ridges to company lumber camps. The camps supplied wood hauled into Lead for both construction and fuel. In 1888 would-be train robbers attempted to steal the payroll bound for a lumber camp. The payroll was aboard a lumber train that the thieves managed to stop. But the robbery was thwarted, in part because the battle-tested Civil War veteran was aboard, armed with a rifle, ready for trouble.



Richard Blackstone

Twenty years later Blackstone could ride another train, not part of Homestake, from Deadwood and Lead to Spearfish. The locomotive steamed around Bald Mountain and dropped into Spearfish Canyon and along the creek – the waters Blackstone was charged with putting into Homestake service. Unlike



Top: Early Spearfish Bottom: Early Lead

Redwater power plant developers, Blackstone didn't have to win support from neighboring land owners. Homestake owned virtually all creek-side land Blackstone could see, as well as portions of the lower creek beyond the canyon.

Spearfish lay more than 30 miles from Lead via the round-about canyon railway, but less than a dozen miles as the crow flew – or as electric lines could be strung. Lead, in the century's first decade, topped 8,000 in population. Row after row of

houses filled steep hillsides, the omnipresent pounding of stamp mills filled the air, and Main Street bustled. At the same time Spearfish ranked among Black Hills towns that were prospering, not fading in the young century, but it stood in sharp contrast to Lead. Its population had yet to reach 1,500, homes and farms stretched across a wide valley, and while Main Street didn't exactly bustle it was a place of profitable businesses and handsome sandstone architecture. A Main Street opera house opened in 1906 and made a thoroughly modern architectural statement with a stage proscenium accented with electric light bulbs. Spearfish had attracted a state normal school for educating teachers and a federal fish hatchery for stocking trout, and both were growing operations. Like Deadwood and Lead, Spearfish first drew settlers who hoped to strike gold. But the first big money began showing up in the late 1870s in the form of Texas cattle. Cattlemen and their cowboys drove herds north, making Spearfish a supply center and operations base. Lush grazing lands lay to the north of town, beyond the irrigated fields of crops that so defined Spearfish. As much as any community in the Black Hills, Spearfish could claim economic diversity. It was certainly no one's "company town," as some Black Hills people considered Lead.

HOMESTAKE DIDN'T MAKE A PUBLIC ANNOUNCEMENT about its Spearfish Canyon plans for a long while, but area newspapers began figuring things out in 1908. That July Spearfish's weekly paper, the Queen City Mail, reported Homestake would gradually phase out steam power at its mine and mills, replacing that energy source with electricity it would generate itself. "The saving is of sufficient importance to make the change from steam to electricity advisable," the paper wrote. The article continued by noting, "it is well understood that Homestake has riparian rights through purchase in the Spearfish canyon and in the valley which gives it an unlimited water supply for power, and it is not at all surprising that the company proposes to make use of the power which is daily running to waste along the Spearfish canyon."



Construction of diversion dam at Maurice.

Water would be diverted from the creek at a point seven miles south of Spearfish, at a spot called Maurice after an old mining camp that once stood there. The elevation drop from the diversion point to the plant was 700 feet. The mine expressed hope that it could capture all creek water at the diversion point, although it admitted that might not be possible, and added there would still be some water in the creek bed because of tributaries emptying into the bed between the diversion point and town.

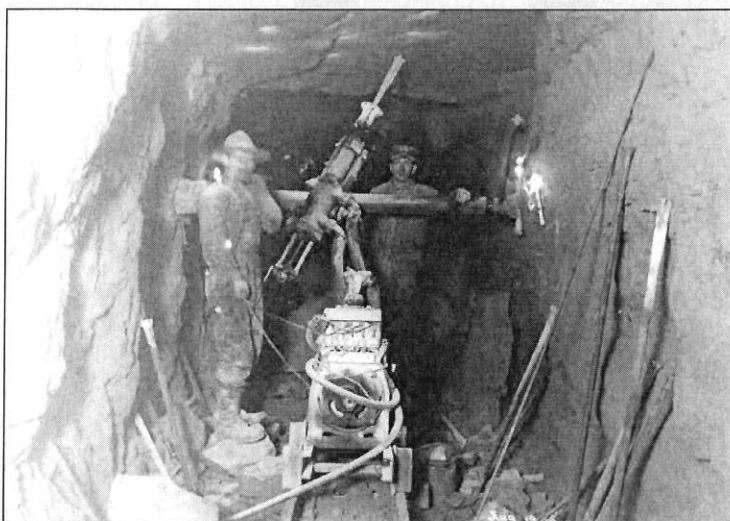


Early 20th century flume.

When Black Hills people heard talk of a water diversion, it was easy for them to picture open flumes, ditches and above-ground pipes that had been part of the local landscape for 40 years, due mostly to mining. But in this case Richard Blackstone had something different in mind. He knew a canyon erodes. Rock slides, mud slides, ridges eaten away – sometimes gradually and sometimes overnight – are what define living, evolving canyons. If Blackstone was to run water to his plant for decades, or maybe for a century or more, he required a system that would function reliably in all seasons, year after year. A flume that collapsed in a rock slide, for example, could close down some mining and milling work until repairs were made. No, Blackstone decided, he would move water underground though miles of tunnels his crews would carve through solid rock. The task would be herculean, but no one in the world claimed more expertise in cutting drifts than Homestake.



Forms for arched tunnel ceilings.



Drilling through Spearfish Canyon's west wall.

During construction and for long afterwards, Black Hills residents often referred to “the tunnel.” Actually the water would move through a series of eight tunnels, separate but tightly connected. Three would measure more than 4,000 feet in length. Workers were to fine-finish them to a much greater degree than mine drifts, with smooth floors and walls so boats could move through for inspection and maintenance. Each tunnel would be cut six-and-a-half feet wide. Walls were to be five feet high with an arching ceiling that added another three-and-a-half feet to the total height. Blackstone decided to make the system as watertight as possible by coating the floors, walls and ceiling with concrete.

By spring, 1909, the Queen City Mail was saying the project would begin within weeks. It would require a million dollar investment and a workforce of 225 to 250 men who, for a year or a more, would perform “the hardest and best kind of work to complete it.” Construction would be

an economic boost for Spearfish, since it was anticipated many of the men would live there and some supplies would be purchased there.

The fact that Blackstone planned to use electricity to create a diversion system for generating more electricity was a story in itself in 1909. “Electric drills of 5 horse power each will be used for this and power for them will be furnished from the company’s present electric plant at Spearfish,” explained the Queen City Mail, referring to the 1904 plant that most people still thought of as Spearfish Electric Light and Power. Sidney Case would play a key role in getting electricity from the plant to the drills.

The Queen City Mail became a cheerleader for the project, noting that very few gold mines could even contemplate anything like this. Three or four years was the life expectancy of some mines considered successful. “With Homestake however,” the newspaper reminded readers, “whose ore supply seems unlimited and whose mine has ore in sight for decades upon decades, such a work is practical, as the money it will ultimately save the company will in the course of years pay for this expensive enterprise.” And certainly no one could complain about the diversion, the paper stressed, because water would be “returned to the creek on the company’s own land, thus avoiding any possibility of any objection to the proceeding.”

Project surveyors used the canyon rail bed as a reference point and engineers charted the underground course with an above-ground string line. Calculations would prove impressively accurate. By late spring Homestake had crews ready to carve tunnels. Each would work the standard Homestake shift, eight hours a day, seven days a week. Blackstone's plans called for each tunnel to be cut simultaneously from either end and, what's more, each crew would be working on two tunnels at a time. A crew based between tunnels one and two, for example, would cut southwest into tunnel one for a day. The next day most of that crew would turn around and cut northeast into tunnel two, while part of the group cleared away debris from



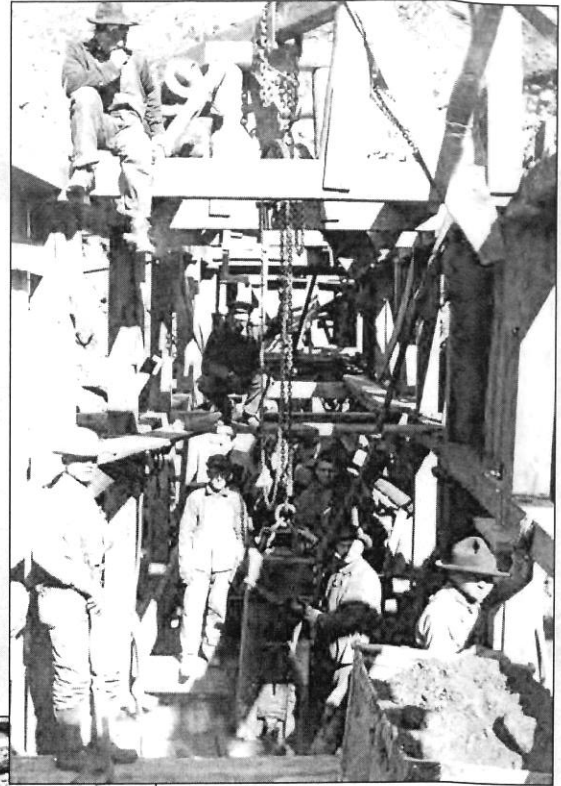
Rail damage after the 1909 flood.

the previous day's work. Back and forth from day to day the work would continue, and typically crews could be expected to progress nine or ten horizontal feet each day. Blackstone hoped each crew would be deep inside tunnels by winter, free from the cold.

But things didn't go as planned in 1909. First a late May flood, fully as fierce as 1904's, swept through the canyon and temporarily knocked out the project's power source and destroyed long sections of the railway. Then in fall tensions between Homestake management and labor hit the boiling point. Grier said that when he agreed to the eight hour workday in 1907, it was because he was dealing in good faith with local men representing fellow miners. But in 1909 there was talk in Lead of forming a more formal union, possibly aligned with a national labor organization, and then demanding Homestake become a "closed shop" that hired union men only. Homestake pushed back, with Grier demanding anyone wishing to continue employment sign a form stating they were not part of a union, and would not join one while on the company's payroll. In late November Homestake locked its 2,800 workers out – from the mine, ore mills, sawmills and canyon hydro project. The company began recruiting replacement workers nationally

and met some success. In Lead, and to a much lesser extent in Spearfish, the lockout pitted families loyal to Homestake management against families who supported unionizing. Some of those rifts would never heal. In Lead, Homestake guards were joined by Pinkerton detectives to prevent sabotage of Homestake equipment. With no paychecks coming in, some families knew true hunger.

A huge company in dispute with its workforce was entirely new to Spearfish. Grier appealed to Spearfish business leaders by buying an ad in the Queen City Mail, running January 12, 1910. It read, "To whom it may concern: In view of the fact that the mining industry in the Black Hills district is the source from which all other business interests in said district derive their main support, and that said industry intends to establish permanently in said district what are com-



Above: Workers pose during Maurice dam construction.

Top Left: Maurice dam in development.



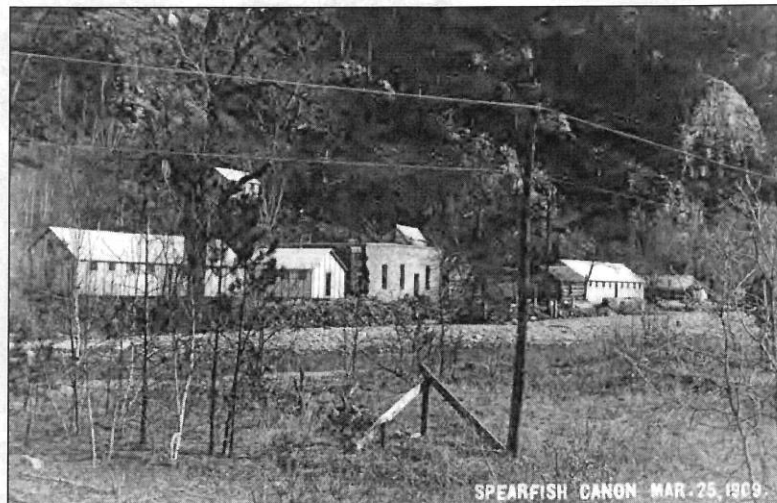
Bottom Left: Water challenged tunnel cutters daily.



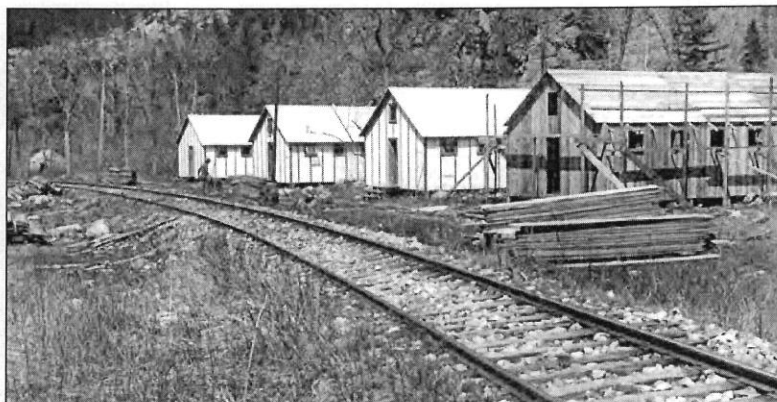
monly called non-union labor conditions, it is respectfully suggested to all such other business interests that their action should be vigorously in support of the aforesaid expressed intention."

Homestake management won. The lockout ended after seven weeks, after enough workers formally disavowed unions so that the company felt it could open its gates. Two more months passed before mine and milling production reached full capacity.

IT'S POSSIBLE THAT DESPITE THE 1909 SETBACKS, Blackstone never believed his diversion crews fell behind schedule. He noted the men mostly encountered limestone, easier to cut than hard rock found in the mine. The hydroelectric project would be in good shape if crews could complete the diversion tunnels in 1910, and early in the year it appeared they would. About half the workers lived in one of two camps Homestake carpenters built, one four miles up the canyon from Spearfish and the other seven miles. Blackstone established his office in the lower camp along with Malcom MacPherson, who took charge of supplies and materials. Another regular presence was Blackstone's son Alexander, also an engineer and a project lieutenant. Well-ventilated wood-frame bunkhouses, each sleeping 20 men, were the main structures at each location. Food was good, most men agreed. The stone shell of the original 1893 Spearfish Electric Light and Power plant was converted into a pleasant dining hall, strictly alcohol free. Signs posted in the camps warned that anyone bringing liquor onto the premises would be fired.



Old Spearfish Electric Light and Power (stone building, center) became a dining hall.



Homestake built worker camps immediately adjacent to rails.



Workers had time to fish Spearfish Creek.

With construction running full capacity through 1910, crews labored round the clock on a schedule of three eight-hour shifts. The eight-hour workday still felt a bit novel and many men used their leisure time to fish Spearfish Creek. In September crews could cheer news that the last tunnel, at the bottom of the series, had been cut completely through. It was now possible to walk 23,862 feet from the intake at Maurice, through the canyon's west wall, and into daylight just above the town of Spearfish. Anyone making that subterranean hike would, of course, notice a steady descent. Before

the last tunnel was completed, a crew began laying a temporary, 22-gauge railroad track the length of the tunnels. Steam-powered locomotives hauled in concrete for lining the tunnels, a job that would require several weeks. Workers would have choked on locomotive smoke had there not been adequate ventilation, and electricity guaranteed that. Power from the 1904 plant ran big fans manufactured by the Sirocco company. Improved ventilation systems in the gold mine, Thomas Grier knew, would be among enhancements resulting from electrification. In fact, better ventilation would eventually allow miners to reach depths unimagined in 1910.



Visitors made rare appearances.



Tunnels were lined with concrete in 1910.

Meanwhile, Homestake carpenters were building a third camp for crews immediately south of the federal fish hatchery, where Spearfish would later develop a city-owned campground. Men living in this camp would complete the lower portions of the diversion system and build the power plant itself, mostly in 1911. Above the town four open-ended standpipes rose, each three feet in diameter and 54 feet high. Although certainly not as noticeable as Lead's shaft head-frame structures, the standpipes marked Spearfish as a Homestake town. The pipes' function was to equalize water pressure, to let air escape out the pipe tops, before the rushing flow was divided into three pipes for its final 4,000 foot sprint into the plant. Each of these pipes got progressively narrower – from 34 inches in diameter down to six-inch nozzles. Water shot from the nozzles with enough force to drop a bull bison. Pelton water wheels would be installed in Hydro No. 1 to capture that force.

Laying 4,000 feet of above-ground pipe for this last diversion phase might have seemed relatively easy to observers, as opposed to tunneling through a mountainside. But in fact, crews would recall, the hillside was a challenging field of boulders. Later, pipes were buried.

The plant was built with the year "1911" displayed above its main doors. Years later the date sometimes misled people who assumed 1911 was when electricity was first produced there. Hydro No. 1's exterior conveyed the feel of 20th century American industry: a bulky three stories of gray concrete. Of course, what the building housed was of greatest importance. Grier and Blackstone selected three Westinghouse generators, each three-phase, 60 cycle, 400 RPM units.

Also in 1911 Homestake crews cut trees through steep, rocky country to create an eleven-mile "pole line," where transmission lines would be strung on poles from Spearfish to Lead. Imported cedar poles were grade A cedar. In Lead a substation took form for diverting electricity to wherever Homestake required it.

In the middle of this flurry of work the mine welcomed a prestigious guest. President William Howard Taft, on a cross-country tour by rail, decided to spend a portion of an afternoon getting to know Homestake. On October 21, 1911 he addressed the public in both Deadwood and Lead, then joined Superintendent Grier and other Homestake officials for an underground tour. The party dropped 1,100 feet in a cage down the Ellison shaft. The President walked several hundred feet through drifts, inspecting equipment along the way, and exited up the Star shaft. He didn't see Spearfish Canyon or any Hydro No. 1 components, but there can be no doubt the hydroelectric system was discussed. In just six months it would transform most of what Taft encountered that day.

In early 1912 Homestake announced that 1911 had been its most prosperous year to date in terms of bullion sold. It added that progress in advancing its hydroelectric project could be considered another measure of a successful year. Everything came to fruition in April as water rushed through the diversion system, hit the Pelton wheels, and put the generators in motion. Next Homestake electricians in Lead jumped into action. "The work of installing the motors and other machinery for electricity is going ahead as fast as it is possible for good workmen to make the changes," the Queen City Mail reported in mid-May, "and soon before people realize it steam will have become a thing of the past in nearly every one of the plants of the company."

It soon became apparent that three generators amounted to overkill, that two at Hydro No. 1 were sufficient. It was the only major miscalculation Grier and Blackstone made in developing the system, and it turned out not to be a problem. Blackstone would put the spare generator to work elsewhere. At Hydro No. 1 two remarkably durable generators would produce electricity with very few interruptions for the rest of Homestake's history – 90 years – and beyond.

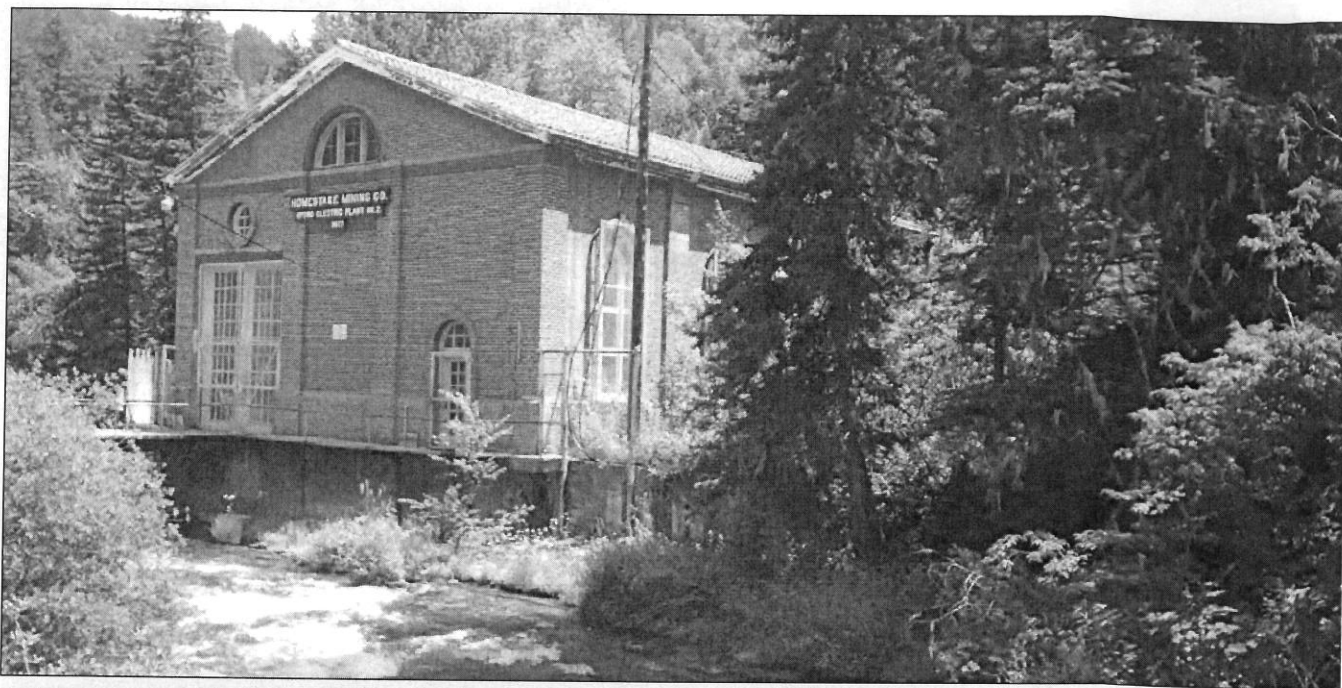
FROM THE PERSPECTIVE OF HOMESTAKE LABORERS, electrification was not the most important company development of the era. Rather, employee benefits granted by Superintendent Grier and the board of directors changed the lives of workers and their families in many ways. While Grier insisted these benefits did not stem from any deal struck during the 1909-10 lockout, it seems likely he knew the affidavits workers signed promising to steer clear of unions wouldn't ward off organized labor forever. With the support of Phoebe Hearst, George Hearst's widow, Grier unveiled health and safety programs no union organizer could dismiss. Homestake operated its own hospital in Lead, and in 1910 the company announced services there would be free to employees and their dependents. The Homestake Employees Aid Fund, also initiated in 1910, made possible affordable health, accident and life insurance. A First Aid and Mine Rescue program went into effect (safety inspections and first aid training were components), and in 1917 a pension plan was established.

What's more, Homestake built a recreation center on Lead's Main street that would testify to the company's belief in modern technologies and creative uses for electricity. Features included a 1,200 seat auditorium, an indoor swimming pool, library, bowling alley, billiards room and reception areas. With the exception of tickets for performances, use of the building was free for Homestake employees and their families. The recreation building opened August 31, 1914 and for Grier the event proved a farewell to the community. Not many people knew, but he was desperately ill, and died three weeks later at age 64. He had served as company superintendent for 30 years.

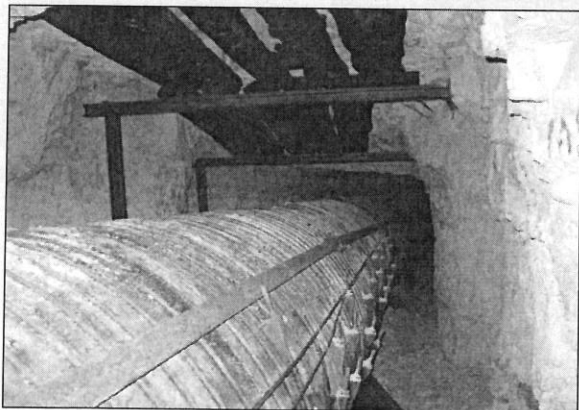
To replace Grier the board of directors selected none other than Richard Blackstone. At age 71, retirement seemed like an attractive option, but Blackstone agreed to serve for a while. He outlined steps

the mine could take to improve operations in the new age of electrification. He led the way in installing electric fans deep in the mine, and in replacing steam pumps with electric counterparts. For miners, better ventilation and electric-switch machinery felt like company benefits in their own right.

A dry 1916 saw Spearfish Canyon water levels drop. Hydro No. 1 kept producing electricity but drier conditions prompted Blackstone to pose a question: In a semi-arid region where water flow would fluctuate, and in a canyon where Homestake owned all water rights, how could the company bypass an opportunity to



Hydro No. 2



In places, the upper diversion pipeline ran through rough-hewn tunnels.

use the water twice? Homestake could divert water miles above its current diversion, run it through a second hydro plant, and release it back into the creek for recapture minutes later. Plans for Hydro No. 2 were drawn, calling for the spare Westinghouse generator to be put into service.

The board of directors approved the plan but insisted on a modification Blackstone didn't like. While the diversion tunnels in the lower canyon were functioning perfectly, the board

believed water delivered through four miles of redwood pipe would serve the second, smaller plant well and save the company money. Blackstone argued the pipeline would be vulnerable to natural disasters, but that was a risk the board was willing to take. Hydro No. 2 was built in 1917 at a spot mid-canyon. The red-brick structure resembled the Englewood plant. Crews assembled the wooden pipeline, buried or running through rough-hewn tunnels in some spots, and running above ground and over trestles in others. Hydro No. 2 began generating electricity in 1918, but by then Blackstone was gone, his resignation effective the end of 1917.

GRIER AND BLACKSTONE'S DIVERSIONS HAD THEIR CRITICS, most notably Richard Hughes – the man who negotiated water rights for the Black Hills Traction Company's hydro plant on Redwater River. In 1927 Hughes wrote his landmark Black Hills history, *Pioneer Years in the Black Hills*, and recounted his



Spearfish standpipes.

own exploration of Spearfish Canyon in 1876. One of his most vivid memories of that adventure was the sight of Spearfish Falls, where Little Spearfish Creek drops into Spearfish Creek. The upper canyon diversion turned the falls dry in 1918, and Hughes also noted a greatly reduced stream at the bottom of the canyon. "While many miles of beautiful water," Hughes wrote, "abundantly supplied with trout, remain for the lover of nature on the upper reaches of the Spearfish and its tributaries, it is much to be regretted that a great part of the district's charm has thus been sacrificed."

Yet it was this altered canyon that Black Hills residents and travelers came to love. The public had first gained easy access into the canyon when the railroad began making runs through it in 1893, but those visitor numbers were dwarfed by the flow of people arriving in automobiles. The Spearfish

Canyon Highway (actually a gravel road its first 20 years) opened in 1930. As originally routed, the highway passed within feet of both Hydro No. 1 and Hydro No. 2.

By 1930 Sidney Case – the Pennsylvania native who arrived in Spearfish in 1898 and soon became a Homestake electrician – was assistant chief at Hydro No. 1. He and Rose lived a short walk south of the plant in a Homestake house. The company ran a telephone line through the diversion tunnels, secured high near the ceilings. Now the line was sagging in places, and Case and Fred Langhoff worked several days in a metal boat repositioning the line. Icy water ran about three feet deep. On February 22, in the lowest tunnel more than a thousand feet from the forebay exit, the boat sank. Case and Langhoff couldn't lift it, so they began wading with the current. At first they were in good spirits but then hypothermia

began taking hold. They got separated and Langhoff managed to reach the open forebay at the tunnel's end, climb out, and use a telephone in a building there. He called Hydro No. 1 for help but was too confused to recognize co-workers when they arrived. Then the men spotted Case's body, which had floated into the forebay.

Writing about Case's funeral, Queen City Mail editor Arthur Nisselius observed, "When nearly half the adult population of a community attends a funeral cortege nearly a mile in length, escorts the remains to their final resting place, the conclusion is inevitable that an outstanding character in the life of a community has finished his career." In its mourning, Spearfish felt like a Homestake town as never before.

In the 1930s the Spearfish Canyon hydro plants contributed to a corporate entity that pulled South Dakota through incredibly hard times. The nation sank into economic depression and the state simultaneously battled drought and grasshopper hordes that devastated agricultural lands. Industries failed, some families fled, and tax revenues dried up. When Governor Tom Berry took office in 1933, he wondered how South Dakota could possibly meet its financial obligations. Members of the state legislature noted Homestake was weathering the depression well, and the idea of an ore tax came up. Homestake fought the proposed tax vigorously, sending lobbyists to the capitol and pleading with legislators to consider working South Dakotans who might suffer if taxation crippled the mine. But a four-percent ore tax passed the legislature and was signed by Governor Berry in 1935. It yielded \$750,000 its first year – fully one-third of the state's budget. In 1937 the legislature increased the ore tax to six percent. Homestake paid more than a million dollars the next tax year, and it narrowly escaped seeing a state corporate income tax law passed, taxing companies in graduated brackets up to 24 percent.

Sensing that South Dakotans were viewing Homestake as a golden goose nothing could kill, Homestake launched a public relations campaign that described costly infrastructure behind gold production. Electricity was part of the story. Less than 20 years after Hydro No. 2 began producing electricity, Homestake's board of directors decided the mine would benefit by substantially more electrical power. There were no more creeks the caliber of Spearfish, so plans were developed for a modern coal-fired operation, the Kirk Power Plant, to be built in a little gulch within view of the Homestake headframes. Construction began in 1934 with a budget of \$1,750,000, and the plant was generating power in 1935 with a 12,000 kilowatt capacity. Homestake kept Kirk production costs affordable by quarrying coal at its own Wyodak grounds near Gillette, Wyoming. The plant burned about 60,000 tons of coal annually. In addition to adding to Homestake's overall electrical capacity, the Kirk Power Plant housed new switching systems for all electricity the company used.

In part the need for more power was driven by the development of the new Ross shaft, taking Homestake miners deeper than ever before – to 3,500 feet below the surface in 1935. The cost of hoisting and pumping increased as shafts and winzes sank deeper and deeper.

Beginning in 1940, and for the next four decades, lines carried electricity from Hydro No. 1 two miles to the new Homestake Sawmill. The company decided to consolidate its lumber production on 211 acres just west of Spearfish, and closed its mills at Galena, Moskee and Nemo. A hundred Homestake workers, many with young families, relocated to Spearfish in time for the November 8, 1940, grand opening. They walked into a mill Homestake proclaimed as modern and safe as any in the country. In the sawmill's original form, logs floated through the milling process in water, drawn from three wells.

In 1940 Homestake employed more than 2,000 workers, was cutting a winze approaching the 5,000 foot mark, and used nearly 60 million kilowatts of electricity annually.

THEN EVERYTHING CHANGED.

The United States was drawn into World War II in December, 1941. In October, 1942 the federal War Production Order L-208 suspended all gold mining as a nonessential industry during wartime. The Homestake Sawmill would continue producing lumber, and after some creative retooling in Lead, some machine shops and the foundry turned out military equipment ranging from gears and wrenches to airplane parts and steel netting.

"I learned to run a lathe, and we made parts for electrical motors," recalled Guy Sawin, who left his family's farm in eastern South Dakota and became a Homestake miner in the early 1930s. "In another shop they made grenade casings. We probably didn't have the most efficient shops because they weren't set up for what we were doing, but still we made a contribution to the war."

Employment on Homestake properties dropped to 800 during the war. Five hundred workers entered military service. Others found new work, including out-of-state mining employment at mines producing metals considered essential – copper, for example. Through it all Homestake's hydroelectric generators kept producing, now supplying power in the name of national security.

Things continued to change for Homestake after the war, too. Not all miners were willing to return underground after experiencing other worksites and gaining new skills. For a few years Homestake struggled to recruit a full workforce. For a while the mine's maintenance department worked doubly hard replacing lumber bracing and piping that deteriorated in the mine during the war.

Major repairs were also in order after a July, 1947 landslide wiped out a section of the above-ground pipeline supplying Hydro No. 2. Richard Blackstone, dead for years, was spared seeing precisely what he feared would happen. As it turned out, a temporary tunnel was cut to carry water to the upper hydro while the pipeline was rebuilt. Homestake was fortunate to also be generating electricity with coal during the crisis. Two years later it would be fortunate again to have the hydro plants running perfectly when the infamous Blizzard of '49 stalled railway movement and the supply of Wyodak coal to Kirk Power Plant.

There were, in those post-war years, a handful of Homestake miners who recalled the era before electrification. For everyone else working the mine by then, the old conditions were unimaginable. To begin with, electric hoist systems got miners in and out of the mine, moving them vertically up and down shafts in cages (and pulling ore up in skips). Big fly-wheel motor generators converted alternating current into direct current, and direct current powered the hoists. The fly-wheels stored energy when the hoists rested, then released it to move miners, equipment, and ore. What's more, as Homestake's public relations department would write, "...milling, treating and refining the ore, pumping water from the mine, adequately ventilating the underground workings, and fabricating, maintaining and repairing machines and equipment are all ravenous consumers of electricity."

Mechanized slushers owed their existence to electricity. They were big metal scrapers that moved broken ore into chutes and dropped it into ore cars. Just one worker could run a powerful electric slusher. The commitment to new technology was part of a 25-year modernization movement throughout Homestake, from about 1950 until 1975. Ore crushing and grinding facilities were rebuilt, while shafts sank ever deeper, into depths where the earth's inner heat challenged ventilation and cooling systems. Virtually every component of modernization required electricity. As early as the 1950s it was apparent that the Kirk Power Plant had to be expanded. Homestake's board of directors opted to sell the Kirk plant to a local utility company, Black Hills Power and Light, in 1954. Two years later it sold the Wyodak coal mining operation to the same utility. Black Hills Power and Light was in a position to improve the Kirk plant, sell electricity to Homestake, and develop additional revenue streams. That left the three hydros as Homestake's

only company-owned power producers. They were modernized in 1968, thanks to Homestake's Kermit Kidner. He devised a means for plant automation so the hydros could be monitored remotely instead of requiring onsite staff 24 hours a day. Prior to gauges that Kidner installed, Hydro No. 1 crews used a telescope to look uphill and get a visual fix on how forebay water levels compared to standpipe levels.

By the end of modernization, in the 1970s, the hydros produced one-third of Homestake's electricity while the rest was purchased commercially. The era of modernization saw changes beyond the technical, too. Fifty-seven years after the labor lockout of 1909 - 1910, the company's hourly laborers voted to unionize in 1966. They became members of the United Steel Workers, Local 7044. The year 1966 would also stand forever as the year Homestake Gold Mine produced a record amount of bullion.

At the same time the company was beginning work toward compliance with new federal environmental laws. The National Environmental Policy Act of 1970 forced the clean-up of Gold Run and Whitewood creeks, streams Black Hills observers noted as running gray early in the 20th century. Now Homestake built wastewater treatment plants and tailing storage areas. It ceased using mercury in processing ore, and that reduced the gold it recovered. In response the company successfully committed itself to developing new recovery techniques.

As Homestake was modernized, so were Black Hills highways so that daily commutes to the mine from other towns were easy. Fast-growing Spearfish, in the 1960s and 1970s, attracted lots of mine families. But Spearfish became less of a Homestake town in February, 1980 when a fire destroyed the company sawmill. Two workers were killed. The sawmill had been modernized extensively just five years earlier, but after the fire Homestake (or actually its subsidiary, Homestake Forest Products Company) announced it wouldn't rebuild. Lumber was no longer used for bracing the mine and much of what the sawmill produced in later years was for outside sales. Before 1980 ended an out-of-state company announced it would build a new sawmill on the site. When it did, it hired many displaced Homestake workers. After 1980 Hydro No. 1 stood again as Spearfish's only Homestake industrial site.

GARY LILLEHAUG, A HOMESTAKE ELECTRICIAN AND ELECTRICAL FOREMAN for nearly 30 years, observed that power lines strung on poles always carried a risk. "The lines had a lot of exposure," he recalled. "That was really the only way the plants went down." The worst case he remembered happened in October, 1982 when heavy snow in the northern Black Hills collapsed lines in several locations between Hydro No. 1 and Lead. "Lots of trees fell," Lillehaug continued, "but I don't think any of the poles snapped. Cross arms on the poles snapped, though." He was part of a crew of six that labored for six weeks making repairs.

Most visible to Lead visitors in the 1980s and '90s was renewed surface gold mining in the Open Cut, a great gash in a ridge immediately adjacent to town. The Open Cut had first been mined a century before. Now it was mined again and greatly expanded as Homestake's modern recovery technology turned low grade ores into profits. Electricity powered a new three-phase crusher plant built for this ore, and also a conveyor pipe that moved the crushed ore more than a mile for milling. Open Cut observers marveled at giant diesel trucks and load-haul-dump vehicles. Out of view, more than a mile underground, similar diesel vehicles and machinery were increasingly used, as well. Electric-powered ventilation systems were vitally important in sweeping all diesel fumes from the depths.

Meanwhile, international gold prices fell flat. Homestake's board of directors looked for ways to function with a leaner workforce. Through the 1990s the company offered employees early retirement

incentives and contract buyouts, and found plenty of takers. In January, 1998 employment numbered 980. Then on a cold Monday morning that month Homestake shocked the Black Hills. It announced it would shut down temporarily for 60 days, pay everyone for that period, but would retain only half the workforce when the mine reopened in spring. The goal was a restructured operation that would continue mining gold for many more years. Geologists said Homestake could expect to extract nearly 50 million ounces of gold in the future, but much of it would be mined in expensive-to-work depths where rock temperatures topped 130 degrees F.

When retained miners returned they assumed new responsibilities, saw less direct supervision, and said some tasks felt lonely. Operations ran smoothly and it was easy to believe the mine had a future. But two-and-a-half years after the reopening Jerry Krambeck, Spearfish mayor and an underground mobile mechanic for Homestake, took a call at work. He was told to come to the surface and report to the mine office. There he was surprised to see mayors from other northern Black Hills communities. They had been called to the meeting because Homestake was preparing to announce its permanent closure, and it wanted to forewarn mayors whose communities would be impacted.

"Almost immediately," Krambeck remembered, "I wrote a letter as mayor telling Homestake the city of Spearfish would be interested in negotiating the purchase of their properties contiguous to Spearfish. We never asked to be given anything."

Krambeck recognized that Hydro No. 1 was a valuable piece of property, still generating electricity as reliably as ever after 88 years. Beyond that, he believed city acquisition would keep the canyon water diversion intact, maintaining Spearfish Creek's flow as the town had known it as long as anyone could remember. Homestake publicly announced the closure on September 11, 2000 saying all mining would cease in fifteen months, on December 31, 2001 (ore processing would continue for a few months past that

date). Fifteen months, it turned out, was nowhere near enough time to seal Spearfish's acquisition of the plant and diversion system. At issue was the Federal Energy Regulatory Commission's (FERC) very specific industrial permit for diverting the water: for the industry of mining ore and milling it. With that industry gone, it could be argued the rationale for taking creek water from its natural stream bed was gone, too. Initially Krambeck hoped FERC might not have



Access door to an upper canyon tunnel, photographed just prior to demolition.

regulatory authority since the canyon diversion predated the federal agency. Krambeck made trips to Washington, D.C. as Hydro No. 1 became, literally, a federal case. He met with FERC regulators and twice testified before Congressional subcommittees.

Back in the Black Hills, the U.S Forest Service and citizens hoping to see Spearfish Creek run its natural course questioned the city of Spearfish's right to divert water. Krambeck said the diversion protected consistent water-flow through town and also consumable water rights irrigators held north of Spearfish. The city moved ahead and agreed to purchase Hydro No. 1 and the diversion system in May, 2004 for \$250,000. After learning FERC did indeed hold regulatory authority, Spearfish initiated a successful process for gaining licensure.

"Homestake wanted the hydro to end up in public hands," Krambeck later reflected. "I think they realized it would really be a stretch for a private company to get through the hoops with FERC."

Spearfish actually bought Hydro No. 1 and the lower canyon diversion system from Barrick Gold Corp., a Toronto-based mining company that bought Homestake properties worldwide in 2001. The mine, mills, Englewood Hydro, and Hydro No. 2 closed. In the canyon, Barrick hired a private contractor to demolish the upper diversion system that had fed Hydro No. 2. Also, four hundred seventy-five power line poles came down, including the cedar poles set in 1911 – most of which survived their long service to Homestake in good shape. But Hydro No. 1's turbines kept spinning. Spearfish reached a deal with Black Hills Power and Light, which would buy the hydro's electricity at a wholesale rate. The utility company built an on-site substation with a 5 megawatt transformer.

During city purchase negotiations and regulatory discussions, it was learned that Homestake-generated electricity contributed to a Nobel Prize. The recipient was Dr. Ray Davis who, in 1964 led a team of Brookhaven National Laboratory scientists that created a physics station in the mine, 4,850 feet below the surface, for studying solar neutrinos. The tiny particles could best be studied with nearly a mile of rock separating them from other neutrinos and sub-atomic matter in the earth's atmosphere. Davis greatly advanced the knowledge of neutrinos, won the Nobel Prize in 2002, and his work was a precursor to the mine becoming an underground science lab after the mine's closing.

Gary Lillehaug, the longtime Homestake electrician and veteran of the 1982 power line repair, was named the city of Spearfish's power plant superintendent. He monitored water levels and power production, made certain the two water wheels were balanced with one another, and kept all equipment oiled and lubricated – including the two 1911 Westinghouse generators. His crew, just as Homestake crews did a century before, made certain screens at the diversion's intake were clear of leaves and other debris. Unchecked, debris will slow water flow and impede power production. Because Hydro No. 1 is federally licensed, Lillehaug would always have FERC reports to file, addressing dam stability, plant maintenance, and even noxious weeds.

Every few years the sound of voices echo again throughout the diversion tunnels. The tunnels are inspected from top to bottom. A crew steps into a boat and the ride takes three to five hours. "We enter at the Maurice intake," said Lillehaug, "and once you're in, you're in – until you come out the other end."



SPEARFISH

Hydro No. 1

Standpipes

Forebay Dam

Aqueduct to
Hydro No. 1

Spearfish Creek

Maurice Dam

Hydro No. 2

NORTH



Aqueduct to
Hydro No. 2

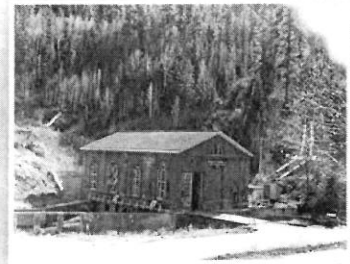
Spearfish Creek

Savoy

Little
Spearfish
Dam

Savoy Dam

Little Spearfish Creek



- ■ ■ ■ ■ Water Diversion
- Spearfish Creek
- Little Spearfish Creek

*Thank you to Mark Zwaschka
for assistance with this map,
and for photos on pages 19 and 24*



THROUGH SPEARFISH CANYON'S WEST WALL...



In 1908 Homestake Gold Mine announced a bold project. It planned to move Spearfish Creek water through tunnels its workforce would cut through solid rock – totaling 23,862 feet. This water, taken out of Spearfish Canyon, would generate electrical power in Spearfish to revolutionize mining operations. While the adventure of tunneling through the canyon's west wall has intrigued Black Hills history buffs for generations, it was just one component in Homestake's commitment to early 20th century industrial technology. This book tells the full story – expert engineering, tough laborers, naysayers, and a labor dispute that temporarily brought everything to a standstill.

The Author -- Paul Higbee is best known to readers as *South Dakota Magazine's* longtime Black Hills feature writer and columnist. He is a past recipient of the Governor's History Award, the author of seven South Dakota-themed books, and has been published extensively out of state, as well.