



The advancement of the science of engineering and the interest of the profession : the Montana Society of Civil Engineers 1887-1899  
by Kathleen Lucille Hendricks

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF ARTS in History  
Montana State University  
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**Abstract:**

On July 5, 1887 a group of mining, mechanical, and civil engineers, architects, and surveyors met in Helena, Montana Territory to form the Montana Society of Civil Engineers. Their purpose was the "advancement of the science of engineering and the interest of the profession." The engineers organized in response to the unique physical and technical problems presented by a new environment, problems which required the sharing of information and experience. They organized to defend their reputations against unqualified and unscrupulous men who claimed to be engineers. They advertised the presence of qualified engineers within the Territory and discouraged the importation of engineers from eastern cities. They exercised a political influence on legislation dealing with matters of engineering and technology.

The paramount goals of the Montana Society of Civil Engineers between 1887 and 1899 were reputation and compensation. The association wished to appear as an advisory body above selfish interests and petty politics. The engineers complained that in spite of exacting standards of education and experience their occupation was ignored, distrusted, and underpaid. They coveted the status attained by the legal and medical professions, which they felt would ensure respect, employment, and financial security.

The early Society was essentially a Helena organization, composed of railway engineers, public land surveyors, gold and silver mining experts, and a few irrigation specialists. By the mid-nineties railroad construction was declining, and many of the Society's charter members left the state. Public land surveys decreased, and surveyors sought employment with cities and counties. Others turned to the construction of hydroelectric plants, or irrigation canals and reservoirs. The decline of silver and expansion of the copper industry drew mining and metallurgical engineers, geologists, and chemists to Butte.

In 1897 the Society acknowledged changes within the profession by amending its name to the Montana Society of Engineers. Civil engineers no longer controlled the organization; increasing specialization and the growth of the mineral industry invalidated the original title. By 1899 the focus of the profession had shifted to Butte's mineral industry. The Society again adjusted, moving the headquarters to Butte. By 1901 increasing technological sophistication encouraged stricter requirements for active membership, but industrialization led to relaxed standards for associate members.

In its first twelve years the Montana Society of Civil Engineers set a precedent of active involvement in the state, in technical development, in legislative action, and in professional standards. But by the end of the century the era of the civil engineers had ended.

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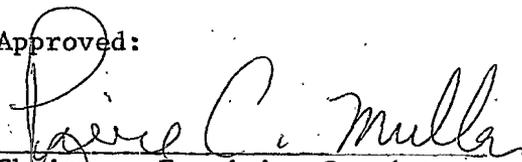
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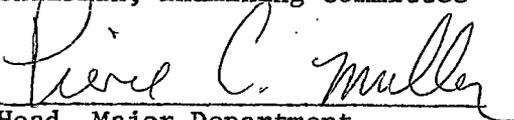
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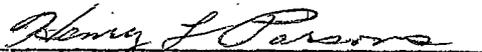
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## ABSTRACT

On July 5, 1887 a group of mining, mechanical, and civil engineers, architects, and surveyors met in Helena, Montana Territory to form the Montana Society of Civil Engineers. Their purpose was the "advancement of the science of engineering and the interest of the profession." The engineers organized in response to the unique physical and technical problems presented by a new environment, problems which required the sharing of information and experience. They organized to defend their reputations against unqualified and unscrupulous men who claimed to be engineers. They advertised the presence of qualified engineers within the Territory and discouraged the importation of engineers from eastern cities. They exercised a political influence on legislation dealing with matters of engineering and technology.

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## CHAPTER 1

### AN ASSESSMENT OF SOURCES

In July 1887 a group of men, composed of civil engineers, mining engineers, and surveyors, met to form the Montana Society of Civil Engineers. This organization, later renamed the Montana Society of Engineers, is still actively involved in engineering in Montana. In 1973 the Society designated Montana State University as its official archives and transferred all records over two years old to that depository.

The story of the records of the Montana Society is not an unusual one, but it has a happier ending than that of most institutional documents of this nature. The Society did not have a clubhouse, so its archives were shifted from place to place and finally disappeared. Occasional attempts were made to trace the papers, but were finally given up in the belief that they had been lost or destroyed.

Then in about 1970, Davidson Piper of the Anaconda Company, a member of the Society, found a box of old papers in a storage room of the Hennessy Building in Butte. (The upper floors of the building house the Anaconda Company offices.) The collection, which included ledgers, correspondence, publications, applications, and minutes of meetings, was turned over to Dix Shevalier of Helena. Mr. Shevalier, a past president of the Society and a member of its Archives Committee, spent many hours cleaning and sorting the papers. In 1973 Mr. Shevalier delivered the collection to Dr. Glenn Martin, Head of the Department of

of Civil Engineering at Montana State University, who had been instrumental in arranging their transfer. Dr. Martin moved the records to the Montana State University Archives, where Ms. Minnie Paugh of Special Collections performed a preliminary inventory.

On receipt of the Society archives, Ms. Paugh inventoried the collection. She arranged the materials chronologically, as far as possible, since it had obviously been so drastically rearranged as to destroy the original order. When an item was undated she left it in the original position with respect to other documents.

The School of Engineering also contributed financially to the historical record of the Montana Society of Engineers, by arranging a research assistantship for a graduate student in history to study the organization and its impact on the development of Montana. I was fortunate enough to be that student, and in August of 1973 began to work with the documents.

The collection has been roughly divided into correspondence, membership lists, membership applications, minutes of meetings, and papers of publications. The correspondence can be classified as letters, financial transactions, proposals for action by the Society and reports of meetings or committees. I see no reason to doubt their authenticity as original records of the organization.

Information for the years from 1887 to 1900 is obviously incomplete. Some correspondence files consist only of transactions;

two receipts comprise the file for 1893. Others include vaguely-worded replies to missing letters. I have been able to add some items to the collection, but much of the information has been gathered from newspapers, particularly the Helena Independent. The Society headquartered in Helena, and often submitted abstracts of meetings to the local papers. Special speakers occasionally attracted news coverage.

Engineering journals, such as Engineering News and the Engineering and Mining Journal yield additional information on professional developments in Montana. The Transactions and Proceedings of the national engineering societies contain some information. From 1888 to 1915 the Montana Society of Civil Engineers was a member of the Association of Engineering Societies, a nationwide group of city and state engineering organizations. The Association published a monthly Journal which carried abstracts of the Society's meetings. The Journal also printed selected papers which had been read before the Montana Society. Copies of parts of the Journal relating to the Society have been added to the collection.

Other sources include contemporary correspondence of some of the members. The F. L. Sizer collection and the Walter W. deLacy collection at the Montana Historical Society were particularly helpful. Secondary sources include histories of Montana and histories of the engineering profession.

One of the problems in working with the collection is that it is an institutional record. The amount and type of material preserved fluctuated with changes in officers. In periods when the Society had no permanent rooms the records were moved about with the officers, and material no doubt was lost. After seventy-five years only fragments of the original documents remain.

The primary value of the correspondence lies in its originality. The letters were written in response to issues and events vital to the Society during the last decade of the nineteenth century. They reveal that the Montana Society of Engineers was recognized by its fellow institutions, to the extent that they requested representation in planning for the Columbia Exposition. This was an era of technical organizations and of professional pride and participation.

A secretary's habit of noting on the back of a letter what action had been taken, e.g. "Read at meeting of Nov 15/90 Ans'd Nov. 22/90 reporting action of MSCE" guides one to the minutes of that particular meeting for a record of the discussion. Letterheads yield addresses and employment records, titles and positions. The style of penmanship and phraseology help one to "get into" the period, and aid in deciphering unclear handwriting.

The letters were written by the central figures of the Society, but not necessarily by central figures in Montana engineering. Often

the men who built the bridges, platted the veins, and surveyed the rail lines were too busy and too mobile to assume the responsibilities of organizational leadership. Also, business letters do not reflect conceptions of oneself and one's role in society as personal letters do.

Some letters reveal more personality: Mr. William A. Haven commented that "If airships were in common use, as an able ex-president of the Am Soc C E hopes soon to be the case, I would gladly take passage & attend your meeting. . . ." Mr. Haven went on to reminisce about the roots of the Society, beginning with Colonel Dodge. He spoke of its use of publicity in matters of public works to uphold engineering standards in the State, and to advertise the existence of expert engineers within Montana. He thanked the members for his election as an Honorary Member, and added that he was now president of the Engineers' Society of Western New York at Buffalo. Mr. Haven, in his nearly illegible writing, left the historian a wealth of information. One is taken back to a time in which air travel was still science fiction to the average citizen. Two of the organizing members of the Society, Mr. Haven and Col. Dodge, are mentioned by name, and policies of the early society are outlined briefly.

Letters are not always so informative. Many referred vaguely to "the matter to which you refer in your favor of the 19th" and one is totally lost as to the subject of the exchange. Elliott Wilson, in a

letter to the Society's Secretary, endorsed the appointment of an alternate delegate to the Committee on the Columbia Exposition, but neglected to give the name of the new delegate. The information is not irretrievable, but a search of engineering journals and newspapers for the Committee proceedings is time consuming.

Financial transactions for the collection are generally fragmentary, but the record for 1899 appears to be quite complete, and yields valuable information on the income and expenses of the Society. On January 20, F. W. Blackford was reimbursed for the expense of type-writing drafts of a proposed bill for State Engineer, indicating an active interest by the Society in legislation concerning their profession. A similar reference to House Bills No. 28 and 29 and to reimbursement of members traveling to Helena to address the legislature confirms this impression. One can go to the Legislative record for further information.

Bills for newspaper offices, such as that of January 21, 1897 for fifteen copies of the Anaconda Standard, send one to the newspaper files in search of a pertinent article. Assessments by the Association of Engineering Societies lead the historian to the Journal of the Association.

The correspondence also included reports of committees, such as the proposed amendments to the Road Law and County Surveyor Law.

A comparison of the proposals with the final legislation provides a hint as to the influence of the Society on the Montana Legislature.

Another category of the correspondence, that of published reports like the Proceedings of the General Committee on the International Engineering Congress. . . helps to establish the position of the Society within the engineering profession, and gives additional insight into the status of engineers in society. In a speech to the Committee, C. C. Bonney, President of the World's Congress Auxiliary Exposition, emphasized his vision of a world-wide cooperation to benefit mankind, and engineers as the architects of the physical structure.

In summary, the Montana Society of Engineers, collection from 1890-1900, is only a vague and truncated reflection of the concerns and activities of the men who composed the Society. The fragmentary nature of the collection, the vagueness of letters and bills, the age of the papers, the blurring of ink, the groupings with no record of who stapled the papers or made the marginal notes, all present problems for the historical researcher. On the other hand, these are original records of the Society, written in response to current events. To my knowledge, they present the only existing internal records of the affairs of the group. No histories have been written on engineering in Montana, so the only other records available are in the technical and engineering journals, local newspapers, biographies and

autobiographies, contemporary histories, or secondary sources. A careful study of the correspondence can provide a guide through these sources, and eventually yield the outline of a picture of the Montana Society of Engineers.

The Montana Society of Engineers was unique among engineering associations, since the organization was formed in 1887, two years before Montana gained statehood. A challenging physical environment yielded opportunity for technological developments. The newness and isolation of the region and the engineering profession's prominence in its development gave the Society an opportunity to shape legislation. Competition from unqualified and unscrupulous men calling themselves "engineer" required establishment of standards of professionalism. The goals throughout the early years, in addition to the development of new technical products and processes, were compensation and reputation.

## CHAPTER 2

### "CO-OPERATION AND ASSOCIATION:" THE NEED FOR A PROFESSIONAL SOCIETY 1867-1887

From Helena, Montana Territory, November 14, 1877, Walter W.

deLacy wrote to his cousin Fannie,

Our new Surveyor General is a very particular man, and examines all papers himself, something that no other before him ever did. He is not a surveyor, but has asked me to teach him the business, so that he can understand it at least theoretically. He is someone, I believe, a very honest and conscientious man, who intends to try & live on his salary and not rob his Deputies. He is not popular here, because he is honest and don't drink whiskey, and comes from Deer Lodge, but he will be a good one for us I think, and I am heartily glad to see an honest administration once more.<sup>1</sup>

DeLacy's surprise at the honesty of the new Surveyor General, Roswell H. Mason, stemmed from a decade's observation of that office. DeLacy had come to Montana in 1859 with Lt. John Mullan, who was building a wagon road from Ft. Benton to the Dalles. In 1861 he returned to the Montana gold fields and spent several years prospecting around Bannack, Virginia City, and as far south as Jackson Hole, Wyoming. In 1864-65 he laid out town sites for Ft. Benton, Deer Lodge, and Argenta, and made the first map of the newly-created Montana Territory. He was appointed Colonel of Engineers by Acting Governor Thomas Meagher, and took charge of a supply train to Ft. C. F. Smith during the "Indian War" of 1867.

DeLacy was by this time a recognized authority on the geography of Montana Territory, and when Solomon Meredith was appointed first Surveyor General of Montana in 1867, he made deLacy his official map-maker. For three years deLacy held the position; he and Benjamin F. Marsh, the field assistant, located the initial point and ran the base line for Montana surveys. In 1871 he left the Helena office for private practice, made surveys for the Union Pacific Railroad, and spent two years as Helena city engineer. Like many engineers and surveyors, he contracted with the surveyor general's office for public land surveys.<sup>2</sup>

State and Territorial surveyors general were presidential appointees, and the spoils system was the order of the day. Each administration replaced current officeholders with personal friends and party-faithfuls. In some cases, the appointees were good, qualified men. Often, however, they took advantage of their limited tenure for personal gain, awarding contracts to friends and extracting bribes from the deputy surveyors.

In 1871 Henry D. Washburn, Montana's second surveyor general, died from exposure suffered in an exploration of the Yellowstone Park area. President Grant appointed John E. Blaine to replace him. Blaine charged deLacy and the other deputy surveyors 20 percent of each contract he let. In 1873 Blaine was tried for extortion and forced to resign, and Grant appointed Andrew J. Smith of New York.<sup>3</sup>

A new appointment presented an additional threat, since Smith might bring assistants with him from the East. The deputy surveyor's position was extremely insecure, based as it was on the whims of Congressional appropriations, political patronage, and the graft of greedy surveyors general. "Federal Officers, who have the giving of Contracts, can practice any amount of extortion," complained deLacy,

1st because they can always find men to take Contracts, who need them, and next because it is useless to complain to higher authorities as every obstacle is thrown in the way of getting a conviction, or having them removed, and 3rd if they are removed the probabilities are that their successors may be worse. Such is the civil service of the U. S. This Surveyor General promises me a good Contract this year if he gets sufficient appropriations, and as nearly all the profitable work will be done then, I shall take no more Contracts, but endeavor to get into some other way of life, where there will be less risk, and perhaps as much profit, and where I will not be under the mortification of having to give up a portion of my earnings to a set of scoundrels. I would not mind it so much if the men sent out here, were not [sic] of ordinary respectability and good habits, but they are not. Our former Surveyor Genl. Blaine, was an awful drunkard, came near being convicted of extortion, and had to resign, and in the course of a few months, was appointed Paymaster in the Army, with the rank of Major. Our present Surveyor General is also a drunkard, and an utterly idle man--has no profession, and after being two years in his office don't know anything about his office except to sign the papers that are presented to him. . . .<sup>4</sup>

In 1877 President Hayes suspended Smith, and appointed Roswell H. Mason, whom deLacy characterized as "the first honest Surveyor General that we have ever had." Mason was sensitive to the problems of the deputy surveyors and to the defects in the system of public land surveys which contributed to corrupt practices. While many of the

charges of greed were undoubtedly justified, part of the problem arose from legislation unfit to the rough, inhospitable land being surveyed.<sup>5</sup>

Montana presents a striking contrast to the broad river valleys of the East, or the gently rolling hills of the Great Plains. The western river valleys are often narrow and winding, framed on either side by steep, heavily-forested mountains. To the east, the Missouri and Yellowstone Rivers and their tributaries boast rich agricultural lands, but the valleys are still narrow by eastern standards, and flanked by 300' embankments. The plains above the rivers are broken by rough canyons a hundred feet deep. The winters are bitter, with occasional -40 degree temperatures, heavy snowfall, and piercing winds; spring comes late and wet, turning streams to torrents and low lands to bogs.<sup>6</sup>

Rough terrain and short, unpredictable seasons hindered the surveyors. The party of Rollin I. Reeves, surveying the boundary between Wyoming and Montana, quit work in the fall of 1879 near Cooke City, Montana Territory. Reeves wrote,

On the morning of October 6th a light snow was falling. . . . On the morning of the 9th while it was still snowing, a part of our number went out on line and brought in the instruments and tools that had been left on line the evening of the 5th. Although this point was not two miles from camp, it was the hardest day's work experienced by several members of the party during the survey. The surface is covered with fallen timber, dense undergrowth, and vast quantities of boulders and broken stones.

The snow was wet and heavy. As it fell from the trees it drenched the men through and through. It required nearly all

day to bring in the instruments. Accordingly the camp was disbanded, some going to Yellowstone Park, some to Bozeman, some to Crow Agency, and others to Fort Washakie. . . .

In the spring the survey continued, and Reeves records the loss of a man who "must have fallen down one of the numerous horrible canyons which are notorious in that region. His horse and coat were found but not himself though vigorous search was made for him along the streams and along the lower levels."<sup>7</sup>

Physical conditions were further complicated by the survey system's administration. Each session of Congress appropriated a lump sum for the survey of each state or territory, and specified the rates to be paid for work done. The surveyor general then let contracts to bonded deputies who carried out the work. On completion of the survey, the deputy made up his notes, which were examined by the surveyor general's staff. If approved, maps and notes were sent to the General Land Office in Washington, D. C., and an examiner checked the work in the field. If the survey was approved, the plats were sent to the land offices, the settlers could enter their claims, and the surveyor was paid.

Meanwhile, the deputy was forced to borrow money to cover his operating expenses. He had to provide all equipment, horses, and board for his men, in addition to salaries. He competed for labor with the farmer and miner, and was forced to pay \$2 per day, including idle days. The season generally began late, due to delays in Congressional

approval of appropriations and ended in October or November with the first heavy snows. During the winter the deputy surveyor spent his time in making up his notes and maps, so was unable to work at other jobs, except perhaps on occasional mineral survey. He also had to pay board for ten or fifteen horses, at \$2 per head per month. Final approval of the survey might take as long as three years, during which the surveyor was charged twelve percent interest on his loan.<sup>8</sup>

Regulations governing the surveys augmented the problem. The appropriation bill specified the classes of land which could be surveyed; deputies surveying other lands would not be paid. Only non-mineral timber lands could be surveyed, and no pastoral lands. The system put the burden on the surveyor, who must decide how the land should be classified. As deLacy pointed out, in a letter to Surveyor General Mason, men unaccustomed to the arid sagebrush flats of the West were often unable to judge the land's fertility.

In 1863, I was one of the first to enter the Stinking Water Valley, on my way to the far famed Alder Gulch. I thought then that I had never seen a more desolate or worthless looking valley. It was covered with sage brush. Within two years this sagebrush land proved to be excellent farming land, and to-day the valley contains many thriving farms, well cultivated, has at least two towns and a large number of herds of cattle, horses, and sheep, besides mines on every side of it.

I have seen the same thing in other places in this Territory, in California, in Idaho, and in Washington Territory. My experience has been a very varied one, yet withal I might survey land and declare that it was agricultural; it might be inspected by some one who had no experience in this country and rejected as such, and I might lose my time, my money, and my employment.<sup>9</sup>

Mason used deLacy's argument to plead for a change in the system. He pointed out that settlers often misrepresented land in requesting a survey, because they were unaware of the classifications and also because they were not sure where the township lines ran. A surveyor might take a contract for a given township, buy provisions, hire a surveying crew, and travel to the site, only to find that it was not agricultural land and thus not surveyable. In this case he was supposed to survey those portions legally acceptable and then find other townships to substitute. "The temptation is great," Mason acknowledged,

to proceed with the subdivision of townships included in his contract, irrespective of the character of the land, especially when, as had been the case for the last two years, the appropriation for surveys is made so late that the deputy cannot get into the field until long after the fiscal year commences; has to work in the late fall and winter, until the snow drives him in, and go out again to finish the work in the spring, when the weather is, if possible, worse.<sup>10</sup>

Mason recommended that the entire territory instead be surveyed into townships, with comprehensive descriptions of topography. More complete surveys could be made as the country was settled.

The Surveyor General also emphasized the importance of examinations in the field. All work was to be inspected by an official who would repeat a portion of the survey, checking for accuracy, construction of corners, and description of topography. Except for examination of the form of the notes, this was the only check on surveyors. Unfortunately, inadequate appropriations limited the surveyor general's staff and

delayed copying of notes and maps and examination of surveys in the field. Many surveys were never examined, either because the surveyor general lacked the time, skill, and funds, or because he considered the position as a sinecure. When fraud was discovered, neither surveyor nor bondsman was prosecuted.

Often the surveys were poorly done, for many of the surveyors were unskilled. Some were railroad engineers who had no experience in land surveys, were unfamiliar with the territory, and did not know how to write up the field notes. Others had no knowledge of surveying at all, or lacked even "the slightest knowledge of mathematics."<sup>11</sup>

The men's morale was undermined by decreases in rates. In the early 1870's rates were \$15. per linear mile on standard lines, \$12. for township, and \$10. for section lines. In 1876 the rates dropped drastically, to \$10. for standard lines, \$7. for township, and \$6. for section lines. Augmented rates were allowed for "heavily timbered land," but the maximum was \$13. per mile, less than the previous standard rate. In 1877 regular rates were the same, but augmented rates rose to \$16. for standard lines, \$14. for township, and \$10. for section lines in "heavily timbered and mountainous" regions. In 1878 Mason compared the 2.8¢ per acre paid Montana surveyors with the 7¢ paid by the Province of Ontario, and requested an increase in rates. Rates were increased in 1880 to \$12., \$10., and \$8., but Mason's report effected no significant changes in the system of public land surveys.<sup>12</sup>

Mason remained in office throughout the Hayes administration, but in 1881 President Chester Arthur appointed Henry M. Teller as Secretary of Interior. John S. Harris, former Louisiana Senator and director of the Texas & Pacific Railroad, became Surveyor General of Montana Territory. The following year Congress again decreased survey rates, allowing \$9. for standard lines, \$7. for township, and \$5. for section lines. Augmented rates were \$13., \$11., and \$7. In less than a decade rates had dropped to sixty percent of the original level, but the least accessible land remained to be surveyed. In 1883 Walter W. deLacy wrote to Congressman Martin Maginnis, warning that at the decreased rates many surveyors had lost money the previous year. Unless rates were revised, none would be willing to take contracts for the next season.<sup>13</sup>

There were, however, other ways to make money in the rapidly-growing western territories. As settlement extended westward homesteaders demanded surveys describing the land so they could file claims. An act of 1862 established the special deposit system, by which settlers demanding a survey deposited its cost in a government depository. After 1871 the settlers were issued certificates of deposit which could be used to pay for homestead or preemption lands in the township being surveyed. In 1879 another act allowed the certificates, or "scrip," to be applied to lands anywhere in the United States. This created a market.

for the certificates, bought by speculators at 93 and 94¢ on the dollar. With time, the schemes became even more elaborate.<sup>14</sup>

In 1882 Frank L. Sizer, Chief Clerk in the Montana Surveyor General's office, wrote to R. W. Burns of Yankton, Dakota Territory,

I wish to tell you confidentially that I know that a large amount of scrip will be issued in this Territory this season, and if you desire I can put you in communication with the parties to whom it will be issued directly--This will be first hands you see and you ought to be able to make a very good bargain with them, but please remember that I must make something out of it--and govern yourself accordingly.

Sizer estimated that a man with \$10,000. cash to invest could realize a twenty-five percent profit within a year.<sup>15</sup>

In addition, Sizer attempted to guarantee the presence of scrip by encouraging settlers to apply for special deposit surveys. He wrote to a friend, E. J. Hall of Denver, that he needed "a sharp business man who can talk well and explain away the doubts of the honest ranchman in regard to signing the Application and the assignment of the scrip."

The business was evidently profitable, for he was willing to pay a starting salary of \$150. per month--equivalent to his own--plus expenses.<sup>16</sup>

Sizer's correspondence indicates that Surveyor General Harris was aware of the scrip schemes, if not actively promoting them. When E. E. Cunningham, ex-Surveyor General of Nebraska, wrote to Harris attempting to get a share in the schemes, he was turned down, but Harris had given Sizer "full swing in the office."<sup>17</sup>

By 1885, when Grover Cleveland was inaugurated President, corruption in the special deposit system was widespread. The new Commissioner of the General Land Office, William A. J. Sparks, reported to Interior Secretary L. C. Q. Lamar that "condonement of irregularities had come to be regarded as a part of the official duty of the supervising and accounting officers of the Government.

I found that augmented rates for surveys were allowed upon no other evidence than the character of the survey warranted such rates that the interest statement of the contractor; that it was common to allow townships to be surveyed other than those originally embraced in the contracts upon which the liabilities were estimated; that it was a frequent practice of deputies to return a survey for part of a township under a deposit for the whole, and omit the remainder as unsurveyable, when upon a new deposit being made another contract would be procured and the land returned as surveyed, or, upon receiving a contract for the survey of a township, the deputy would execute the easier portion and leave the more difficult to remain unsurveyed and to become subject to an extra charge to the government hereafter, and that it has not been uncommon for deputies to be paid twice for doing the same work, once for the original survey and again for 're-tracing' it under another contract.<sup>18</sup>

While these conditions did not exist to the same degree in all the western states and territories, reform obviously was needed in the public land surveys. When Harris left office in 1885, deLacy's friends recommended his appointment as Surveyor General, but Interior Secretary Lamar appointed an old school friend, Benjamin H. Greene. Greene's appointment, based on his acquaintance with Lamar, was not unusual. His uniqueness derived from that fact that he was a practicing engineer, with a substantial reputation.

When Greene arrived in Helena, he and deLacy discovered that they had worked together as engineers on the New Orleans and Jackson Railroad in 1852. The two men had much in common; both were born in the South though deLacy, born in 1819, was ten years older than Greene. Both men were college graduates, and deLacy had been tutored at West Point (though never admitted) and taught at Army and Navy schools. Both began their engineering careers in railroad construction, both were involved in surveys for road and canal schemes in the southern states and in Central America. Greene served in the Confederate Army, deLacy volunteered for the Mexican War and the Yakima Indian War of 1855. Both had endured physical hardships--Greene on Confederate battlefields and Mississippi levee reconstruction, deLacy on Southwestern deserts and in building roads to Canadian gold fields--and were victims of the cyclic financial crises and the political maneuvering of nineteenth-century America.<sup>19</sup>

DeLacy readily accepted Greene's offer of a position as Chief Mineral Clerk, confiding to Fannie that

It suits me very well, what with my knees, and my being so heavy, it is difficult for me to get along over the mountains, and I shall be glad to have a rest. There are so many surveyors in town, and everywhere, that it is difficult to make more than a living--and there will be plenty more to come with these railroads.<sup>20</sup>

Railroad location and construction brought many surveyors and civil engineers to the West. In 1886 the Great Northern Railway was approaching Great Falls, and its subsidiary, the Montana Central, was

building lines linking communities along the Continental Divide. The Northern Pacific, unable to build branch lines until the road was completed to Tacoma, organized the Northern Pacific & Montana Railway Company to begin adjunct work in Montana. Competition was keen, J. J. Donovan of the Northern Pacific recalled, "crossing in the field, fighting in the courts, yet with no bad blood between the two corps of engineers." And when the Montana Central reached Helena, rival engineers welcomed it with a sign, "'N. P. Pay your money. Take your choice. M. C.'" Location was not always so peaceable; E. H. McHenry recalled an armed confrontation when the Northern Pacific "jumped" part of the Union Pacific's abandoned line between Dillon and Helena.<sup>21</sup>

Generally, though, the engineers were more concerned with problems of climate and terrain. John Stevens, writing in 1926, recalled his discovery of the Marias Pass in 1889. E. H. Beckler, Chief Engineer of the Puget Sound extension of the Great Northern, hired Stevens to search for the legendary pass through the northern Rockies. Stevens left Ft. Assiniboine, near Havre, in late November, with some inaccurate reconnaissance sketches, team and driver, a saddle horse, and an assistant from St. Paul "whose friendship for John Barleycorn made him worse than useless to me." The party traveled through blizzards all the way to the Blackfoot Agency, where the white man balked. The Blackfoot Indians, fearing the evil spirit at the river's head, refused to accompany Stevens. A Flathead murderer seeking

refuge with the Blackfoot finally agreed to go, for the price of some woolen underwear, a red blanket, and the promise of a jug of whiskey when they returned. The Indian "played out" near the false summit, so Stevens built him a fire and continued west. He found the pass and satisfied himself that he had found the Pacific watershed, but it was too near dark to return.

It was practically impossible to build and keep a fire going, so I tramped a track about a hundred yards in length and walked it back and forth until enough daylight broke to make it safe to travel. . . .When I reached the Agency, I found that the mercury had been at 36 deg. below at the Agency the night I spent on the summit, some 1500 feet higher and what it was there, the good Lord only knows but the mosquitos didn't bother me.

Location of the Great Northern Railway through Marias Pass shortened the line a hundred miles and saved in curvature and grade line, making the Hill road the most efficient and economical of the transcontinental lines.<sup>22</sup>

The problems of curvature and grade plagued mountain railway location. W. A. Haven, Northern Pacific & Montana Railway engineer, came to Montana from the Erie Railway where maximum grade was five-tenths percent and curvature four degrees. On the line from Helena to Butte his superior set the limits of a four percent grade and a twenty degree curve. "I might say," Haven added, "that we did not exceed these limits excepting on the railroad from Boulder to Elkhorn, where we made a four percent grade and a twenty-two degree curve." He had trouble, however, finding a locating engineer who could survey to a

grade line until his leveler, E. H. McHenry, said he could do the work. "All right, go ahead; if you can do it your pay will be \$100 per month as a starter, instead of \$40 as leveler." So this was the beginning of the upward growth of McHenry."<sup>23</sup>

In 1889 McHenry, searching for an economical route for the Northern Pacific line east from Butte, reconnoitered Pipestone Pass and discovered the pass he named the "Homestake."

On the western side of the [Homestake] pass, the slopes were very precipitous, dropping 800 feet in three-quarters of a mile to the upper "bench" of the Black Tail Valley; there was, however, ample distance in which to make the descent before the crossing of Silver Bow Creek was reached and accordingly there were no location problems to be solved on this side of the mountain, apart from the difficulties introduced by the excessive roughness of the slopes which is a characteristic feature of the granite formation of this general region. This condition was very marked in the Homestake Canyon on the eastern slope of the mountain which later taxed both the physical and trigonometrical powers of the engineers to their utmost in fixing and marking the line of definite location, thru the wild and tangled mass of huge boulders, timber and brush as then encountered.

Incidentally, these conditions afforded good shelter for both bears and mountain lions which were frequently and in some cases, most humorously encountered by the engineers, until they were finally driven out by the heavy blasting, when the construction of the roadbed was begun.<sup>24</sup>

Bears and mountain lions, inclement weather, rugged mountains and swift snow-fed streams all presented physical and technical problems for engineers trained on eastern railroads. The civil engineers recognized the advantages of sharing new and innovative skills.

Montana's mineral wealth presented another challenge, as the mining engineers developed elaborate mechanical and chemical processes

to deal with the stubborn ores. By 1886 placer mining had given way to quartz and silver operations, and investors recognized Butte's copper potential. In 1885 Montana produced \$21,954,150. worth of gold, silver, copper, and lead, an increase of fifty percent over the previous year. Of that total, silver contributed \$11.5 million, copper \$6.78 million, and gold 3.4 million. By 1887 the respective values were \$17.8 million, \$8.85 million, and \$6 million, for a total over \$33 million. Mines, smelters and mills required knowledgeable management, attracting engineers from the Comstock Lode, from eastern states, and from other engineering pursuits.<sup>25</sup>

Montana's engineers were gaining recognition for their expertise, serving on special committees advising cities and counties on engineering development. In June of 1886 Benjamin Greene, Walter W. deLacy, and Col. J. T. Dodge, Chief Engineer of the Montana Central Railroad, were appointed to a commission on a sewer system for the city of Helena. The commission was apparently an advisory body to City Engineer George K. Reeder, who had presented a detailed report to the city council. The Independent commended the report, but added,

It shows consideration beyond his years, but we must differ with Alderman Duff's assertion, that he is competent, in conjunction with the sewerage committee, to devise a system satisfactory to the city. It is entirely too large a question to be handled by any but experienced sanitary engineers and the amount involved is too great. . . .<sup>26</sup>

The Helena paper's demand for an "experienced sanitary engineer" illustrated the local engineers' lack of status. Thirty years later

W. A. Haven recalled his humiliation when Helena "sent to St. Paul to get an Engineer to tell her how a city on a steep hillside could be drained."<sup>27</sup>

Montana's engineers were becoming aware of themselves as a profession, in the sense of a group of men whose occupations required specialized skill acquired through education and experience. Greene's arrival in late 1885 coincided with Montana's development into a state; with the movement for reform in public land surveys; with rapid expansion of railways, mines, and smelters; and with a national trend toward organization of scientific and technical professions. Contact among deputy surveyors operating out of Greene's office and the railroad and mining engineers headquartered in Helena contributed to a sense of unity. Territorial demands for statehood added a note of permanency, and engineers began to think of themselves as citizens of Montana, with professional reputations to protect.<sup>28</sup>

An immediate concern was to exclude incompetents, such as inexperienced surveyors and speculators, from practice of engineering. Protection was needed, too, against attempts to reform the public land surveys. Cleveland, Lamar, and Sparks threatened both the surveyors' reputations and their economic interests. Letters by individuals such as deLacy and Mason had been relatively ineffective in raising rates, setting standards for deputy surveyors, or amending the survey system, but an organized group could exert more influence.

On March 22, 1887 a group of Montana engineers and surveyors met to take "the preliminary steps toward the organization of a Territorial Society of Civil Engrs. and Surveyors. . . ." which would be known as the Montana Society of Civil Engineers. Sixteen men are listed in the Society's records as Organizing Members: Benjamin H. Greene, Montana Surveyor General; Eldridge Beckler, Chief Engineer of the Montana Central Railway; Joseph Harper, Butte City Engineer; Henry B. Davis, Deputy Mineral Surveyor; James Keerl, Chief Clerk, Surveyor General's office; John Wade, Deputy Mineral Surveyor; Joseph T. Dodge, Chief Engineer in the construction of the Mullan Tunnel; Elliott H. Wilson, Deputy Mineral Surveyor; Adelbert E. Cumming, Deputy Surveyor; Robert J. Walker, Deputy Surveyor; L. R. Lothrop, Division Engineer, NP & Montana Railroad; Walter W. deLacy, Chief Draftsman, Surveyor General's office; George Reeder, Helena City Engineer; Sigmund Deutsch, Deputy Surveyor; George O. Foss, Assistant Engineer, NP & Montana Railroad; and George Swallow, Montana Inspector of Mines. These occupations were by no means exclusive. Some men gained experience with the railroads, went on to survey public lands or mining claims, then bought an interest in a promising mine, or built and operated a smelter. In the nineteenth century "civil engineer" usually meant "civilian engineer," as distinguished from military engineers. As the engineering profession expanded, requiring unique skills acquired through specialized education or practice, mining, metallurgical,

mechanical, and electrical engineers demanded the distinction of precise titles. "Civil" was confined to construction, transportation, irrigation and city and county engineering. Biographical information on the men is incomplete, but of the sixteen, at least eight were college graduates and six of those had studied civil engineering. At least fourteen had worked as railroad engineers, four on irrigation or flood control, twelve were surveyors, six owned or managed mining properties, three had taught, and five were city engineers.<sup>29</sup>

In May Reeder, Wade, and Keerl issued a circular inviting the Territory's engineers to a meeting in July. The invitation reviewed the March meeting, explaining that "It was the sense of the meeting that if other professions were benefitted by cooperation and association, that similar advantages will accrue to our prospective society."<sup>30</sup>

The desire for association was based on a realistic assessment of the profession's status in Montana. Fraud and incompetence in public land surveys threatened its reputation; city and county governments refused to recognize local engineers' skill and responsibility; railroads and mines required new techniques adapted to the physical environment. In addition, the region's rapid growth attracted engineers from the East, where professional associations were well-established. In Montana they found unique opportunities to influence legislation, to direct development, and to set precedents for professional standards.

Organization of a professional society marked a change in attitude of Montana engineers. They no longer regarded the Territory as a temporary location to be exploited for quick profits. Instead she presented vast opportunities for development, and the engineering profession would lead in that development. "Montana," boasted E. H. Wilson at the Society's first annual meeting, "affords the best of fields for the exercise of professional skill.

Her granite barriers separate four valleys which demand union. Her hills abound in metallic wealth and the experiences there with our brothers, the mining engineers, have placed them in the vanguard of progress. Munificent nature assures us that in these valleys and on the flanks of these mountains a populous empire will be supported--demanding the best efforts of the mechanical, mining and civil engineer. In the lustre which the next decade will shed on Montana's developments, let the past and present be fulfilled, and let us all, fellow members, endeavor to make the name of Civil Engineers' Society of Montana shine bright.<sup>31</sup>

### CHAPTER 3

#### "THE MAIDEN EFFORT;" LEGISLATION AND INFORMATION 1887-1889

By 1887, Montana was no longer a wilderness. The frontier was gone, Indians were relegated to reservations, placer mining had given way to a sophisticated mineral industry, and agriculture was spreading throughout the fertile valleys. Twenty years of development had revealed the wealth of the Territory's resources; she anticipated her status as the "Treasure State," and clamored for entrance into the federal union. Butte's copper mines rapidly expanded, smelters were built, and high-grade matte was shipped east for refining. In 1887 Marcus Daly's Lower Works Smelter processed 3000 tons of copper ore per day. That year Montana produced \$5,978,536. worth of gold, \$17,817,548. worth of silver, and 78,700,000 pounds of copper.<sup>32</sup>

While the primary source of Montana's wealth was mineral, territorial entrepreneurs recognized the potential of her forests and rich agricultural lands. The Territory boasted nearly half a million head of cattle, valued at \$9.5 million, and a million head of sheep worth over \$2 million. Nor was the region uncivilized. Montana's two hundred school districts enrolled 12,000 pupils. Already half a dozen towns claimed over 1000 inhabitants, and agricultural communities planned flour mills and breweries. The Utah & Northern Railroad from Ogden to Silver Bow had been completed in 1881, and the Northern Pacific

connected Helena with the East in 1883. The St. Paul, Minneapolis and Manitoba, renamed the Great Northern, reached Great Falls in 1887. The mood of the Territory was one of optimism, promotion, and expansion. Engineers obviously would play a major part in Montana's growth.<sup>33</sup>

To assure and direct their role, a group of engineers met on March 22, 1887, and appointed a committee "to draft a Memorial to the Engrs. and Svrs. of the Territory asking their cöoperation in the organization of a Territorial Society of Civil Engrs. and Surveyors." The idea of a professional organization met with approval, and July 5, 1887 forty-six men gathered in Helena, in the office of Surveyor General Greene, to organize the Montana Society of Civil Engineers.<sup>34</sup>

Colonel J. T. Dodge was elected president. He had been Chief Engineer for the Northern Pacific's Mullan tunnel, and built the Helena & Jefferson Railroad from Helena to Wickes. First Vice President was Elliott H. Wilson, who had come to Montana in 1871 to survey the Northern Pacific route. In 1884, following construction work on the Union Pacific, he settled in Butte as a U. S. Deputy Mineral Surveyor. George K. Reeder, Helena City Engineer was elected Second Vice President.

Secretary and Librarian James K. Keerl had worked on the Louisiana Division of the Texas & Pacific Railroad under Benjamin Greene. When Greene was appointed Surveyor General of Montana Territory, Keerl accompanied him as Chief Clerk. John W. Wade, Treasurer, came to Montana in 1880 to work on the Helena & Northern Pacific Railway, later

was elected Lewis and Clarke County Surveyor, then Helena City Engineer.

The Society elected three trustees: Eldridge H. Beckler had been Engineer-in-Charge of the Bozeman Tunnel on the Northern Pacific, and in 1887 replaced Dodge as Chief Engineer of the Montana Central Railway. Joseph Harper came to Montana from the Union Pacific, built the Glendale smelter for the Hecla Consolidated Mining Company, and in 1884 was elected Silver Bow County Surveyor. The third trustee was Walter W. deLacy, Montana's "Pioneer Engineer."

At its first meeting the Society adopted a constitution and by-laws. While the name specified "civil engineers," mining and mechanical engineers and architects were also admitted. The stated goal of the organization was the "advancement of the science of engineering and the interests of the profession." The Montana Society of Civil Engineers would accomplish this goal by providing social interaction and intellectual stimulation, by exchanging knowledge of processes and products, by publicizing accomplishments of the profession, and by unifying the Montana engineers into a group capable of exerting political force in Territorial affairs.<sup>35</sup>

The first monthly meeting of the Montana Society of Civil Engineers was held August 20, 1887, when some of the members met in Dodge's rooms to discuss engineering subjects. "These meetings," commented the Helena Independent,

promise to be very interesting and profitable to the members of the profession and in the mountain country where difficult engineering problems are constantly arising, the discussion in the society may prove highly valuable.<sup>36</sup>

A week later the Society held a special meeting to issue a memorial on the death of Colonel J. B. Clough, Engineer-in-Charge of Northern Pacific work in Montana. Clough was not a member of the Society; the resolutions praising his engineering ability indicated a desire to call the Territory's attention to the accomplishments of the profession as a whole.<sup>37</sup>

Throughout the fall of 1887 the Society was rather inactive, probably because the engineers were racing to finish their surveys and construction projects before winter. In October President Dodge retired and returned to the East. Apparently no one replaced him in office until the annual meeting, in January 1888, when George Reeder was elected President, and E. H. Beckler became Second Vice President.<sup>38</sup>

The first annual meeting was a gala affair; the business meeting was followed by a three-hour banquet featuring

Blue Point Oysters with Celery.  
 Consomme Imperial.  
 Brook Trout with Parisienne Potatoes,  
 Sauce Maitre d'Hotel.  
 Sweet Breads with French Peas,  
 Lardia Filia of Beef with Champignons,  
 Mashed Potatoes and Asparagus.  
 Chicken Salad with Mayonaise Dressing.  
 Peach Ice Cream,  
 Fruit Cake, Lady Fingers, Macaroons.  
 Meringue Kisses, Confectionary.  
 Oranges.  
 Roquefort Cheese, Stilton Cheese,  
 Water Crackers.  
 French Coffee and Cognac.<sup>39</sup>

Laudatory toasts followed the dinner. "Let us congratulate ourselves," began E. H. Wilson, "on membership in a profession which builds monuments for the comfort and happiness of humanity.

.....  
 We are asked what practical good is offered with membership in our society? I would answer that as engineers it will credit us with laudable ambition at least among our professional brothers. It will invite a healthy emulation among ourselves. It will publish in our own communities the fact that Montana has experts amply equipped to conduct the system of improvements that her development demands.

The opinion of our society should form an oracle whose adverse criticism will be a bar to slovenly, venal or unprofessional practice on the part of outsiders as well as members. It may, by the insurance of good work on the part of its members, secure to us suitable reward for our exertions.

These are the promised benefits to secure which we should remember that upon each one of us individually, in whatever capacity employed, devolves the duty of protecting the good name of the society and the profession. . . .<sup>40</sup>

The Montana Society immediately began the program outlined by Wilson--developing its reputation within the state and among national engineering societies; upgrading professional practice, thereby insuring employment and financial rewards; and protecting the name of the Society and of the profession. One way of gaining publicity on a national scale was by affiliation with the Association of Engineering Societies. The Association was a union of state and local societies, extending from Boston to Kansas City, from Wisconsin to St. Louis. The monthly Journal provided reasonably inexpensive publication of papers and proceedings, acquainted Montana engineers with new technical processes, and provided a forum for discussing common concerns. The most crucial

argument for joining the Association of Engineering Societies was the need for unity within the profession.<sup>41</sup>

The civil engineers' alliance was directed against the domination of army engineers in national public works. The chief complaint was that army engineers were put in charge of public works, relegating civilian engineers to subordinate rank and lower pay. Competent civil engineers refused to work under such conditions, and national public improvements suffered as a result. West Point graduates acquired abstruse theory, but lacked the pragmatism needed for successful engineering. While recognizing military engineers' proficiency in their field, the civil engineers resented "the establishment of a sort of titled nobility in the profession," and insisted that civil works were the specialty of civilian engineers.<sup>42</sup>

The Council of Engineering Societies on National Public Works, formed in 1886, had introduced the Cullom-Breckenridge bill to create a bureau of harbors and waterways and a corps of civilian engineers to plan and construct all public works. The Montana Society of Civil Engineers joined the movement. In April 1888, it drafted a memorial to Congress, supporting the Council's activities and recommending the proposed bill as a solution to the wasteful, underpaid, and poorly-executed system then in existence.<sup>43</sup>

Engineering societies tried to gain status as experts not only in construction, but also in regulation. In July 1888 the

Montana Society received a letter from the Western Society of Civil Engineers at Chicago, concerning state appointment of engineers to inspect highway bridges. The members responded favorably to the idea of a state engineer, and agreed to cooperate with the Western Society in setting a scale of minimum rates "for preparing working plans and specifications for bridges." Ex-President Dodge wrote that "there is no place where the public is more exposed to danger than in crossing a bridge; there is no work where expert knowledge is more requisite. . . ." Yet in many cases highway bridges were constructed by unskilled laborers, with no expert supervision.<sup>44</sup>

The Society did not agree, however, that a state engineer should extend his inspection to railroad bridges. First of all, the State might then be held responsible in case of failure, and secondly, a responsible company would employ an engineer equally, if not more competent. The state engineer "would, to a large extent, be remunerated by the honor of the position, and the intense satisfaction afforded through the opportunity presented of serving the public, . . . ." Montana engineers apparently doubted that an engineer's sense of public responsibility would overcome the financial advantage offered by corporate employment.<sup>45</sup>

The reluctance to regulate railroad bridges reflected, at least partially, the dominance of railroad men in the Society. In 1887 and 1888 the officers were all organizing members of the Society, and all

civil engineers who had worked in railroad location and construction or as deputy surveyors. Technical discussion emphasized such topics as "Railway Location," "Tracklaying of the Montana Central Railway," or "whether a locomotive engine was capable of producing as much effective power while backing as when pulling. . . ."46

In 1889 the Society, though still concerned with railroads, became involved in a variety of subjects. That January Benjamin H. Greene, Montana Surveyor General, was elected President of the Society, Elbridge Beckler became First Vice President, and Henry B. Davis Second Vice President. Davis had worked on the Northern Pacific, surveyed public lands, and in 1885 was elected Deer Lodge County Surveyor. Treasurer Charles W. Helmick was the partner of George Reeder, and Thomas T. Baker, who replaced Harper as Trustee, had been the first Silver Bow County Surveyor. Baker was also a competent mining engineer, the first to hold office in the Society.

The second annual meeting included an excursion to Butte and Anaconda. The Society held its business meeting on January 19, 1889 in Helena, then on the twenty-first took the Montana Central Railway to Butte, observing details of construction on the way. After lunch the group boarded the Montana Union train for Anaconda, where they were met by Marcus Daly and conducted through the "Swansea of the West." Returning to Butte, they met for the annual reports of the Secretary and Treasurer and an address by retiring President Reeder on "The

Panama Canal." The banquet, with the usual toasts and speeches, lasted from 10 p.m. to 3 a.m., but the men were up the next morning for a tour of the Butte mines and smelters.<sup>47</sup>

At the afternoon business meeting A. B. Knight, a Butte mining engineer, proposed that the name of the Society be amended to "The Montana Society of Engineers." He explained that the change would be more consistent with the qualification for membership, and "that the objects of the Society would probably be promoted by the change indicated." Civil engineers held the balance of power, however, for the amendment failed by a vote of fifteen affirmative to sixteen negative.<sup>48</sup>

At the same meeting, George Foss presented a paper discussing problems of defining mineral locations from county records. The paper, along with a letter from George H. Robinson on mineral location, led to two bills which were presented to the Legislature in February 1889.<sup>49</sup>

On February 12, 1889 the Montana Society called a special meeting to discuss a bill on the location and recording of mining claims. After considerable debate and several amendments, James Keerl suggested that the bill be examined by an attorney, to assure consistency with federal laws. Those in favor argued that

the bill affected materially the mining interests of the territory and would doubtless receive severe criticism from those affected; that this being the first appearance of the Society before the Legislature it was very important that the legality of the provisions of the bill should be inquired into in advance by those most competent to judge.

Others argued that legal advice was an unnecessary expense, since several members of the committee which drafted the bill were U. S. deputy mineral surveyors, and familiar with federal statutes.<sup>50</sup>

The second argument won, and the bill was presented on February 14 by W. H. Roberts of Butte. House Bill 34 was entitled "an act to amend sections 1477, 1478, 1479, 1483, 1485 and 1486 of the fifth division, compiled statutes of Montana, relating to the location and recording of mineral claims." It provided for prompt, precise recording of mineral claims and for immediate location work to establish ownership. The act specified the details of boundary markers, and provided for survey by a deputy mineral surveyor. Ensuing debate centered around the requirement that the locator must sink a ten foot discovery shaft, or an adit or tunnel ten feet long, within sixty days of posting notice on the claim.<sup>51</sup>

On March 6, before the committee of the whole, Swiggert of Jefferson County moved that the section on location be omitted, since it was already covered by federal laws and the Territory could not "add anything to the United States laws." Haskell assured him that the proposal did not conflict with federal law, and Roberts added that the bill was patterned after Colorado law, which had experienced no problems. Speaker Lee Mantle of Butte urged retention of the section, as a deterrent to speculation. Swiggert withdrew his motion and the law, amended

to extend the proof-of-labor clause to placer claims, passed the House by a vote of twenty-one to one.<sup>52</sup>

In the Council, the committee on mines and minerals reported the bill without recommendation, but the committee of the whole, on motion of Huffman of Custer County, recommended that it not pass. House bill 34 lost by a tie vote, five to five, with two members absent. Bickford of Missoula announced that he would move to reconsider the vote, but no action was taken before the Legislature adjourned the following day.<sup>53</sup>

The Helena Independent deplored the Council's failure to reform abuses in mineral entries. The paper had supported the bill, arguing that

It is well known that hundreds of mining locations in this territory are irregularly made and have no actual value; that no work is done upon them during the time allowed for the first year's representation work, and that at the expiration of that time the claims are relocated under other names in the interest of the original locators, without any real development work being done upon them. The result has been that the practical development of mineral claims has been retarded for speculative purposes to the injury of bona fide miners and the territory at large. . . .<sup>54</sup>

The Society's other bill, which called for an accurate survey of all town and village sites and additions, and provided for filing and copying plats, fared better. On February 14 William Thompson of Deer Lodge introduced Council Bill 36, "a bill for an act to amend sections 2031, 2032, 2033, 2034, 2037 and 2038, of the fifth division of the compiled statutes of Montana, relating to town and village sites and plats." Council Bill 36 was reported out of committee on March 7, with

amendments enlarging the monuments marking the intersection of streets. On the 12th the bill passed as amended, by a vote of nine to two, one member absent.<sup>55</sup>

The House committee on towns, counties and highways reported the bill without recommendation and on March 14, on recommendation of the committee of the whole, the bill passed seventeen to five. The Council concurred in the House amendment, and Governor P. H. Leslie signed the bill on the fourteenth.<sup>56</sup>

While Council Bill 36 was celebrated as "the Society's maiden effort toward framing legislation," the results were not entirely satisfactory. At the May 1889 meeting James Keerl commented that the amendment requiring approval by county commissioners before plats could be filed delayed sale of the property. The Montana Society of Civil Engineers was being blamed "for introducing so unreasonable a provision in the bill," while the fault actually lay with the Legislature. The Society also criticized legislative action on boiler inspection, noting that the method required by the new law was not only obsolete, but was liable to damage the boiler. They also objected to the horse-power qualification regulating licensing of engine operators, which bore little relationship to the responsibility of the position.<sup>57</sup>

The Society's activism attracted the attention of Montana's Congressional delegate T. H. Carter. In June of 1889 he met with the Society, informed them that the Senate Committee on Irrigation would

visit Montana in August, and asked the engineers to collect data on the potential of irrigation in the Territory. Carter was already convinced, for he assured the Society that

the lands of Montana [were] one-fifth good agricultural, three-fifths grazing land and one-fifth mountainous, and that by judicious husbanding of waters the three-fifths grazing land could be made good agricultural land, and that a part of the one-fifth mountainous could be raised to a high state of cultivation.

These predictions were exceptionally optimistic, but the subject of irrigation was becoming critical. In the dry summer of 1889 armed men were guarding their ditches and crops were drying up; engineering technology promised to alleviate the problem.

The Montana Society appointed a committee which sent a questionnaire throughout the Territory. It requested information on existing canals and ditches, potential sites for reservoirs, average annual snowfall, soil type, production with and without irrigation, and a variety of other details. Chairman Walter W. deLacy, complaining that "the others were not going to do anything," wrote the report with the help of Secretary George Foss. It consisted of a county-by-county breakdown, totals for the Territory, and an elaborate map. The report estimated that with irrigation 20,000,000 acres of arid land could be reclaimed, an area twenty times the acreage then under cultivation and twenty-one and four-tenths percent of Montana's total area. Land value would increase from \$1. to \$10. per acre, livestock and personal property would jump \$100,000,000., and the population would grow to 1,500,000.

"All this can be brought about by an expenditure, which compared with the magnificent results to be accomplished, would be but a mere bagatelle."<sup>59</sup>

On August 9, at the Helena hearing, the Montana Society presented the report to the Senate Committee. The carefully prepared document confirmed the Committee's optimism, and lent a scientific guise to their oratory. Committee Chairman William Stewart of Nevada addressed the Montana Constitutional Convention that same day. He referred to the recent testimonies as evidence that Montana soil, when irrigated, would produce nearly twice as much per acre as eastern lands.<sup>60</sup>

The Society had already memorialized the Convention on the subject of irrigation, petitioning for the creation of an office of State Engineer whose duties would include inspection of all dams and reservoirs. Its statement, presented in the state July 29 by Delegate J. K. Toole of Lewis and Clarke, emphasized the need for trained experts in engineering works.

The "Montana Society of Civil Engineers" would respectfully represent to your honorable body that the subject of irrigation is now assuming the greatest importance to all the people of Montana--that in the near future there will be constructed large and extensive reservoirs, irrigating canals and other hydraulic works of great magnitude, requiring a large amount of engineering skill and experience, and that the lack of competent professional advice may lead to great loss of capital and life, as has been demonstrated in this Territory in the past and more recently in the terrible disaster at Johnstown, Pa., and the requisite safety can only be obtained through the inspection of the plans for such works--and the works themselves--by a competent engineer.<sup>61</sup>

While the Convention's committee on irrigation reported the petition adversely, as a legislative rather than constitutional matter, the Montana Society had achieved one of its objectives. The public was now aware of the organization's existence, and of its willingness to intervene in the affairs of the new state as they related to engineering topics.<sup>62</sup>

At the third annual meeting, January 18, 1890, retiring Secretary James Keerl reviewed the past year's events, and added that

all the good work of a Society of this character is not necessarily accomplished through preparing abstruse papers on engineering subjects, for there was a great field open to it in influencing legislation with a view of shaping and securing proper direction of both private and public improvement of an engineering character; that the existence of a Society of this character would appear to signify the acceptance of certain responsibilities to the State and in conclusion hoped the Montana Society would not be found wanting in their full discharge.<sup>63</sup>

Within two and one-half years of its organization, the Montana Society of Civil Engineers had already attained part of its goal of professional recognition. It had been accepted as an advisory and information-gathering body for both state and federal legislation.

## CHAPTER 4

### "THE ADVANCEMENT OF OUR PROFESSION AND THE INTEREST OF OUR SOCIETY:" INTERNAL REFORM 1890-1892

While the Montana Society of Civil Engineers was deeply involved with local concerns in the late 1880's, it continued to agitate for reform in federal legislation. In the two decades before the Society organized, several individuals had attempted to reform public land surveys, among them Surveyor General Roswell H. Mason and U. S. Deputy Surveyor Walter W. deLacy. The first Cleveland administration made some improvements, but general conditions were still highly unsatisfactory. A chief complaint was insufficient appropriations. Standard rates remained, despite repeated pleas by surveyors general, at the 1885 level of \$9. per linear mile, \$7. for township, and \$5. for section lines. The inability of surveyors general to let contracts at these prices indicates that they were indeed too low.<sup>64</sup>

In the spring of 1887 Montana's Surveyor General Benjamin Greene notified the Commissioner of the General Land Office that he had "not received a single bid" for survey of lands involving the timber trespasses of the Montana Improvement Company and the Northern Pacific Railroad. Hesitancy to take the contract was due, not to the political and economic power of those companies, but to the adverse terrain--"with the exception of a narrow strip of valley land from 300 yards to a mile wide along the Hell Gate river and Clarke's fork of the Columbia river mainly mountainous and covered with timber," the "insufficient

compensation," and inadequate clerical staffs which delayed approval of surveys for up to three years, forcing surveyors to pay excessive interest on loans for operating expenses.<sup>65</sup>

In 1888 the Fiftieth Congress added augmented rates of \$13., \$11., and \$7., and in 1889 was forced to concede that "in cases of exceptional difficulties," rates might be further increased to \$18. per linear mile, \$15. for township and \$12. for section lines.<sup>66</sup>

Public land surveys were of vital interest to the Montana Society, since at least half of the members had worked as deputy surveyors or deputy mineral surveyors. In the early years surveyors held most of the offices, and in 1889 Surveyor General Greene was elected President of the Society. That February Robert J. Walker, a deputy surveyor, read a paper on "Manner of Conducting Public Land Surveys in Montana." He noted that the "present system of land surveys only costs the government about 2½ cents an acre. Better work would be accomplished by making the surveys by a corps of salaried men, and conducted as railroad surveys now are." In the fall, following a letter from Charles Griffith suggesting a memorial to Congress, and a "history of public land surveys" by Walter W. deLacy, the Society drafted a letter to Congressman Thomas Carter.<sup>67</sup>

The letter, dated December 2, 1889, recommended that all surveyors and topographers undergo an examination in mathematics, surveying techniques, writing of field notes, astronomy, and sufficient

geology and mineralogy to make topographical descriptions. The variety of topics would ensure a balance between theory and practice. Each year the surveyor general should send out parties to areas needing surveys. They should be instructed to run standard and township lines, and in agricultural areas section lines. Topographic descriptions would aid settlers in accurate filing of claims. Frequent reports mailed to the surveyor general from the field would allow flexibility in orders, and hasten transmission of the reports to Washington for final approval. Examinations should be prompt, random, and thorough to detect fraud, and offenders must be prosecuted.

These changes would, the Society acknowledged, probably cost more than the present system, but the advantages would be substantial. Qualified personnel would have the time and incentive to do a thorough job; their comprehensive records would be useful to settlers, the military, scientists and engineers, and entrepreneurs. The savings in litigation and resurveys, and the income from prompt development of land claims would more than compensate for the added expense.<sup>68</sup>

The Society's report was reinforced by Montana's new Surveyor General, George O. Eaton. In 1890 he announced that increased rates and restriction of surveys to settled and agricultural lands permitted the letting of contracts for the entire apportionment, but the rates were still low for the lands remaining to be surveyed. "It is found by experience that it is impossible to survey this country (with any

profit to the surveyor) even at the highest augmented rates allowed.

Under the most favorable circumstances the ground in any specified section of the country is generally so broken, and the quantity which can be surveyed so difficult to estimate, that even in large contracts it falls short, and the surveyor finds that he has made a large outlay for a comparatively small compensation. Hence it is notorious that it is almost impossible to have surveys made in the distant and rough sections of the State unless the settlers assist the surveyor with their own labor, or that of their teams, free of charge. They should not be put to this expense; the compensation should be such as to justify the surveyor in undertaking the work without calling on the settlers for aid.<sup>69</sup>

The following year Eaton renewed his appeal, noting that all Montana land remaining to be surveyed could classify for augmented rates, if the qualifications were not applied rigidly to fractional parts of each mile. He suggested that "a just and fair interpretation of the law will permit a whole contract to be paid for at augmented rates if it is in a broken, rough, or underbrush country." Settlers added their petitions, complaining that they were unable to file claims or build fences and permanent structures until their claims were surveyed.<sup>70</sup>

By 1891 the appropriation bill allowed rates as high as \$25., \$23., and \$20. for areas "heavily timbered, mountainous, or covered with dense undergrowth," in the states of Washington and Oregon; in 1892 the rates were extended to Montana. An additional allocation for Montana, to extend the seventh standard parallel north, permitted a rate of \$40. per linear mile.<sup>71</sup>

How much of the increase was due to the Montana Society of Civil Engineers is difficult to estimate, but legislators noticed its efforts. In 1891 Senator T. C. Power sent a copy of his Senate Bill 663 to the Society, with a request for its opinion. At the annual meeting January 9, 1892 the engineers endorsed the bill's provision for topographic description and precise elevations of all prominent points not crossed by survey lines. Those details would facilitate location of claims in the land offices, for as matters stood topographic details were filled in by clerks in the surveyor general's office, and the plats bore little resemblance to the landscape. The Society's report added that the increased duties would necessitate an increase in the already inadequate rates, to a minimum of \$8. per linear mile, and an additional \$4. for mountainous or heavily-timbered land.<sup>72</sup>

At the February meeting the committee withdrew its report in order to increase and classify the rates. The revised report, adopted April 9, warned that parsimony resulted in hurried, careless surveys, and that no competent surveyor would take a contract at present rates. The additional requirements, demanding use of a transit rather than a plain compass, increased expenses by one hundred percent; fees had been reduced by forty percent.

After discussing details of interest rates and the rugged country remaining to be surveyed, the committee recommended minimum rates of "\$14. for Base, Standard, Meridian and Meander Lines; \$10. for

Township lines and \$8. for Section and Connection Lines;" augmented rates of \$22., \$16., and \$13. for "mountainous, or heavily timbered, or covered with dense undergrowth;" \$25., \$23., and \$20. for any two of those classifications; and \$30., \$28., and \$24., in areas where all three conditions existed. The report ended with the remainder that "work half paid for is never done properly," and that until rates were adequate to attract competent surveyors additional requirements would be of little value.<sup>73</sup>

The Montana Society sent a copy of the report to T. H. Carter, now Commissioner of the General Land Office, who replied that he had already reported favorably on the bill. Senate Bill 663 died in committee, but the rates were raised in 1892 to \$25., \$23., and \$20. for "lands heavily timbered, mountainous, or covered with dense undergrowth."<sup>74</sup>

Except for the recommendations on public land surveys, the Montana Society of Civil Engineers was relatively inactive during the years from 1890 to 1892. Frank Sizer corresponded briefly with T. H. Carter on revision of federal mining laws, and committees were appointed to draft legislation on open shafts and prospect holes and to petition "with regard to the absurdities of running connecting lines of mineral surveys." Apparently these desultory efforts bore little fruit. Instead, the Society's energies were directed toward increasing

its status through cooperation within the profession and through strict internal regulation.<sup>75</sup>

In June of 1889 the American Society of Civil Engineers corresponded with city and state societies on a plan to affiliate with local engineering associations. The Montana Society of Civil Engineers adopted its committee's report on May 3, 1890, but left no record of the report itself. Another member of the Association of Engineering Societies, the Western Society of Engineers, rejected the proposal. The Chicago engineers complained that the plans offered by the national organization were too limited. They preferred a combination of affiliation and federation which would assure local societies' autonomy. The Montanans may have reacted similarly; the advantages of cooperation were obvious, but independence prevailed. The civil engineers never reached an agreement, for on March 4, 1890, the American Society of Civil Engineers rejected Article IX of the proposed constitution, which provided for affiliation.<sup>76</sup>

Unity among the engineering societies reappeared as a theme of the International Engineering Congress of the Columbian Exposition, to be held in Chicago in 1893. The Western Society of Engineers invited the American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Mining Engineers, American Institute of Electrical Engineers, Canadian Society of Civil Engineers, and

several state and local societies to meet in Chicago October 1, 1890 to organize a convention.

to not only consider the many great works which our profession has performed for the use and convenience of man, but to learn from each other much that will be of mutual benefit; to obtain a consensus of opinion on many important principles and projects now in process of development; and, finally, to hold that extended social intercourse enjoyed by engineers only on such rare occasions. While these reasons refer largely to the advantages of such a Congress from an international point of view, we are deeply sensible of the necessity and importance of bringing together the various, but almost distinct branches of engineering of our own country, in order that we may come, for the time at least, into more cordial sympathy and learn from each other much of importance in those branches in which each is expert.<sup>77</sup>

The Montana engineers did not meet in the summer, so they received the invitation too late to attend the meeting. They did, however, appoint a delegate, Elliott H. Wilson, and alternate, F. A. Ross. They also pledged financial support for the Congress. At the fourth annual meeting in January 1891 the Society agreed to contribute generously, but by mid-1892 Ross was writing from Chicago that he "did not like to state that the M. S. C. E. had only \$50.00 to forward, so that I stated the entire assessment was ready to be remitted upon call." Ross's evasion was prompted by reluctance to admit that the small Montana organization was experiencing growing pains.<sup>78</sup>

Beginning with the annual meeting of 1890, interest in the Society declined. Five papers were presented in 1889, but only one in the three years from January 1890 to January 1893. The American Society of Civil Engineers requested papers for the civil engineering section of

International Congress, but none was presented by the Montana Society. In spite of a membership of fifty-five to sixty-five, between five and seven members attended the monthly meetings and only three regular meetings are recorded in the Association of Engineering Societies Journal for 1892.<sup>79</sup>

The annual meetings in January attracted larger attendance than the regular meetings, though the one of 1890 was subdued in comparison to previous gatherings. On January 4, 1890 the Society's President, Benjamin Greene, died of Bright's disease, and the engineers cancelled an excursion to Marysville and a banquet at the "Helena." Instead, ten members and two guests met to hear reports by the secretary, treasurer, and several committees. Elbridge Beckler was elected President; John Gillie, Butte mining engineer, First Vice President; and John Herron of the Montana Central Railway, Second Vice President. Charles Griffith, Secretary and Librarian, was a U. S. deputy surveyor. Treasurer Albert S. Hovey was a deputy mineral surveyor; his partner, Adelbert Cumming, was elected Trustee for three years.<sup>80</sup>

The visit to Marysville, postponed until January 17, 1891, drew a group of twenty members and eleven guests. R. T. Bayliss and George H. Robinson, both charter members of the Society, conducted the group through the mills and mines. They viewed an electrically-powered spiral registry to prevent cage-collisions in the shafts and a mining transit designed by Robinson. At the evening meeting in Helena, E. H. Wilson,

a Butte mining engineer, was elected President. First Vice President John Herron and Second Vice President George H. Robinson were also mining engineers. James Keerl, who had replaced Griffith in mid-1890, was reelected Secretary-Librarian; Hovey was reelected Treasurer, and deLacy was returned to the office of Trustee for the next three years. The membership had grown slightly, to fifty-seven active and three associate members. Three members had been dropped for non-payment of dues.<sup>81</sup>

Eighteen members attended the 1892 meeting, which consisted of a business meeting and banquet. Walter W. deLacy was elected President; A. B. Knight of Butte, First Vice President; James Keerl, Second Vice President. Francis D. Jones of the surveyor general's office was elected Secretary and Librarian, A. S. Hovey continued as Treasurer, and E. H. Wilson became Trustee.<sup>82</sup>

The organization's finances showed a similar slump. In 1890 the Treasurer reported a balance of \$69.50, with \$232.00 worth of uncollected dues; subtraction of outstanding bills left net assets of \$221.50. On motion of James Keerl dues were increased from \$5. to \$10. a year for Helena members and \$8. for "non-residents" living within the state. In spite of the increase, the Society's financial condition deteriorated. In 1891 the balance was \$62.53, with uncollected dues of \$199. and net assets of \$1.53. In 1892 the Treasury showed a balance of \$129.71, but the Society owed \$120. pro rata share of the expenses

of the International Engineering Congress. By January of 1893 the Society's assets totaled \$34.21, with an additional \$302.00 due from members.<sup>83</sup>

Years later W. A. Haven, President in 1893-94, implied that part of the financial problem was unprofessional members. In 1887 the Society had enrolled several "mechanics," who performed engineering services but lacked the education and skill of the professional engineer. These members received the Association of Engineering Societies Journal, but refused to pay dues. When Haven billed them they responded, "We are patrons and not expected to pay dues." The Society suspended the delinquent members and removed their names from the Journal's mailing list. At the same time, the engineers began to demand more stringent investigation of applicants.<sup>84</sup>

The debate over election of members began in March, 1890. L. O. Danse, a Helena architect, proposed that the section of the Constitution requiring a three-fourths vote to elect members be replaced by a provision that "Five negative votes shall debar the candidate from admission." The motion provoked a heated debate over the goals of the Society, the problems of oligarchic rule, and the degree of elitism necessary to maintain professional status. James Keerl, who was an organizer of the Society and one of its most active members, protested that "the adoption of the amendment might prove dangerous to the welfare and progress of the Society, giving an

opportunity to those disposed of exerting a 'one man power' influence.

He requested that the members observe the full force of the object of the Society as expressed in the Constitution, "The advancement of the science of engineering and the interests of the profession," for while he recognized that personally an applicant for membership might be unpopular, yet he might possess qualifications of the highest order, fitting him to assist materially, through his knowledge and experience, the advancement of our profession and the interest of our Society. . . .

Keerl added that, in principle, the power to reject a candidate should rest with a proportion rather than a fixed number of the Society. He felt that the three-fourths necessary to elect a member should screen the applicants adequately.<sup>85</sup>

Danse responded that at present the three men endorsing a candidate exerted "one man power," since no applicant had been rejected. Others added that in some cases they had felt it was useless to vote against a candidate, even if considered undesirable. Such lax methods of admission jeopardized the Society's reputation.<sup>86</sup>

In accordance with the Constitution, letter ballots were sent to all members. At the April meeting Danse's amendment passed by a vote of fifteen to four, but the vote was declared unconstitutional. At the May meeting, W. A. Haven proposed that all applications be referred to the trustees for approval before the members voted. Further discussion led to the appointment of a committee to amend the Constitution and By-Laws.<sup>87</sup>

Ten months later, at the March 1891 meeting, the committee

presented a revised Constitution and By-Laws. After discussion and amendment, the report was referred back to the committee, and in May the final draft was accepted, to be voted on by letter ballot of the entire Society. On August 17, 1891 the ballots were canvassed and the new Constitution was adopted. Of the sixty-three members only ten had voted, all in the affirmative.<sup>88</sup>

The revised version incorporated both proposed amendments, requiring that applications must be approved by the trustees, by members present at the next monthly meeting, and finally by letter ballot of the Society. Five negative votes disqualified the candidate. The Constitution also stated the organization's purpose as "the advancement of Engineering and the interests of the profession," to be achieved by

the reading and discussion of scientific papers and matters of scientific and practical interest, and the cultivation of professional and social intercourse among its members; the collection of a library, and the publication of such parts of the transactions as may be deemed expedient.<sup>89</sup>

The By-Laws also provided for suspension or expulsion of members for "any infraction of its rules and regulations and for professional misconduct calculated to affect the good name of the Society, or interfere with order or harmony." All disciplinary actions must be confidential, of course, to maintain the status and dignity of the organization and the profession.<sup>90</sup>

The Montana Society repeatedly emphasized the importance of maintaining its reputation. In mid-February, 1891, the association

concluded that it would be "inexpedient" to petition the State Legislature for an office of State Engineer, since there appeared to be little need, and

it would tend to degrade the Montana Society of Civil Engineers, as a scientific body, in the estimation of the public for it to ask the Legislature to create a new department to be filled almost entirely by its members, or those who may become such; . . .

The Society would take advantage of the two years before the next legislative session to collect data on state engineers in the trans-Mississippi West, to contact legislators individually, and to educate the public concerning the need for a professional to oversee public works. Then, when the people of Montana demanded a State Engineer, the Society would be ready to advise the Legislature on details of the Act.<sup>91</sup>

This report demonstrated the engineers' extreme sensitivity to public criticism. In his annual address of January, 1892, retiring President Elliott Wilson expressed a similar sentiment, warning that engineers were often blamed for the failure of projects. Employers, he observed, too often regard the engineer as merely a data-gathering machine; their disregard for his judgment results in failure of the enterprise, and the public blames the engineer. "I beseech you," he concluded,

in all your practice, do not permit the selfish wishes of employers to allow you to slight your own work. Do not do "cheap" work. Do not as you value your future reputations, permit yourself to enter into competition for employment which involves slighting your work or leaves a monument behind you which may be quoted as an example of ignorance, incapacity, or rascality. Insist upon

taking a stand above that of the old-time "county surveyor" and though you do his work, insist upon exercising your talents, as engineers, rather than as laborers at so much per day. In employment in positions of trust, as dealing with titles, clients disposed to take unfair and fraudulent advantages of others, should understand that they should look for men to do their dirty work outside of the members of our society. Let us carry into our professional relations with the public a full realization of the dignity of our profession and refuse to debase it, to the mere level of a bread-winning trade.<sup>92</sup>

## CHAPTER 5

### "A PUBLIC FORUM TO BE RESPECTED AND CONSULTED:" IRRIGATION, ROADS, AND SURVEYS 1893-1895

The Montana Society of Civil Engineers' desire to be recognized as an advisory body above petty politics or selfish interests was gratified in December of 1892 when Donald Bradford, the engineer-entrepreneur who had constructed the Dearborn canal, asked the Society to review his bill "to establish Irrigation Departments & to create a State Irrigation Commission." The engineers met on the 30th to discuss the bill, and transmitted their recommendations to Bradford.<sup>93</sup>

At the annual meeting of January 14, 1893, President Haven announced that Representative Huffman of Custer had introduced an irrigation act substantially different from the Bradford bill. When the bill was read at the evening session, however, the members saw no "material difference." House Bill 24 provided

for a Board of four commissioners who are to control all the water of the State for irrigation purposes, to condemn existing works and water rights, to establish the rate of water rents and levy taxes; also for an issue of bonds for the construction or purchase of irrigation works. All new works are to be constructed and all monies expended by the commission.<sup>94</sup>

The committee on the Bradford bill repeated their objections, particularly that the commission had too much power, and that at least one member should be a civil engineer "with the title of state engineer." H. B. Davis of Deer Lodge opposed the creation of a state engineer "simply as a sinecure," but Frank Sizer responded that a system like

Colorado's would create an immediate demand for the office. The Society had recommended the Colorado system to the Constitutional Convention in 1889. The system provided that the State Engineer would inspect and supervise all irrigation works, supervise the water commissioners in each district, and administer water rights on a state-wide basis. In 1893 the Montana engineers also discussed the Wyoming system, which further provided for the State Engineer's approval of any appropriations of water.<sup>95</sup>

Composition of the State Water Commission introduced the possibility of fraud and corruption. H. P. Rolfe objected that "the office of Commissioner would be more sought after than the office of U. S. Senator is at present." The powers granted the Commission would tempt a member

to become a Jay Gould; that's the way it looks to me. In other words, there is a great chance there for fraud and stealing, and unless there are such safeguards thrown around it as to prevent this I dont [sic] think the State can afford to have such a law as this.<sup>96</sup>

The problem could be solved, in part, by the appointment of a State Engineer as an ex-officio member of the Commission. The Huffman bill provided that the Commission "shall employ a State Engineer" to plan and oversee construction projects, but the ambiguous term "employ" raised the issue of whether the engineer was appointed by the governor as a check on the Commissioners, or by the Commission itself. In the latter case he ran the risk of becoming "a creature of the Commission

and subject to removal by them." In addition, the two year term was too short for effective action by either the Water Board or the Engineer.<sup>97</sup>

Another issue was the constitutionality of state control of irrigation. George Foss explained that under the Montana Constitution all water belonged to the state, which could reassert its claim at any time. The other alternative, construction of projects by private companies, he rejected with the comment, "I believe that we are too much in the habit of giving away the rights that belong to the people to private parties." Others argued that it was better to attract out-of-state monies than to bankrupt Montana's treasury in paying the interest and principal on bonds for construction. In states such as California, districts were unable to sell bonds because the arid land on which they were organized had no collateral value. On the other hand, the magnitude of projects necessary to irrigate the northern and eastern parts of the state demanded government intervention, either state or federal.<sup>98</sup>

Some members objected to massive irrigation projects on the grounds of feasibility; first, that there was insufficient water and secondly, that evaporation precluded storage in huge reservoirs. A. G. Lombard pointed out that a comprehensive system would require destroying existing structures, many of which served quite well. Furthermore, condemnation of private property, i.e. existing structures, would fill the courts with litigants and cost both State and individual time and

money. The engineers recognized this as a primary obstacle to public acceptance of the act.

After a lengthy discussion, the Montana Society adopted a resolution endorsing state ownership and construction of irrigation works. They objected to the Huffman Bill because it did not provide "suitable safeguards" for property rights and financial integrity. The engineers also used this opportunity to recommend the appointment of a state engineer to supervise all engineering work in the state.<sup>99</sup>

The Helena Daily Independent followed the debate with interest, publishing not only the proceedings of the Society, but also editorial comment and letters from individuals on the subject of the Huffman bill and irrigation in general. The arguments tended to follow those of the engineers, with a strange mixture of hard-headed business, booster optimism, and political ideology. In late January and early February, the Independent carried an exchange between B. F. Shuart, a Bozeman stockgrower, and Will Kennedy, Boulder journalist, leader of Montana's single-tax association, and Populist gubernatorial candidate in 1892.

Shuart opposed the bill as "class legislation of the rankest sort," arguing that there was no security for the bonds. Thus the state would be liable, though only a few of its taxpayers would benefit. He further argued that even if the irrigation system were developed settlement would be too slow to pay for the ditches.

Free land, as in the humid states, and reclaimed land at a minimum cost of \$10 per acre, as in the arid states, are startlingly different propositions to the land seeker; to which is now added the further discussion that agricultural production has reached a development in these states which has forced prices down to very slender and unattractive margins of profit. . . .<sup>100</sup>

Kennedy's answer was prompt and pointed; good citizens should correct, rather than reject, the proposed law. Corporations were gobbling up water rights in the state, making action imperative. Within a few years water rents could repay state funds and help to support the government, giving tax relief to all citizens. Kennedy saw irrigation as a state enterprise which would encourage settlement and bring prosperity to all Montanans.<sup>101</sup>

Shuart's rebuttal concentrated on political and economic realities. Water rents, he claimed, could not even maintain ditches, much less support the State. In addition, counties would never consent to completing a project in another county without some construction in their own. The Commission would be forced to build elaborate projects simultaneously. The work would demand additional bonds, exhaust the Commission's credit, and prevent completion of any part of the work. Shuart suggested that the governor appoint a committee to investigate and frame a bill for the next legislature.<sup>102</sup>

The debate might have continued to the end of the legislative session, had not Montana's Irrigation Convention met on February 9 and 10. The Huffman bill was a primary issue; the Convention invited

the House of Representatives to attend the evening session to hear discussion of the bill. The debate went beyond the issues of bonds and taxes, to ideological arguments. "If the people of Montana," declared Z. T. Burton of Choteau,

wanted the state to go into the irrigation business, why not follow the thing out to its logical conclusion and go into the flour, clothing and sheep business. That would be one step toward the Bellamy theory.

Helena delegate A. H. Nelson retorted that he "did not want to be under the domination of a Hagan as was the case in California, where that man controlled a vast section of country by reason of his irrigation enterprises."<sup>103</sup>

The following morning the Convention, by a vote of twenty-five to nine, petitioned the Legislature that House Bill 24 not pass. The result was not surprising considering the furor over financing and property rights, and the fact that several delegates to the Convention were also members of the Montana Society of Civil Engineers, which had opposed the bill earlier. On the fourteenth the House Committee on Irrigation reported the bill without recommendation. It was placed on general orders and quietly forgotten. Even the Independent, staunch 104 supporter of the bill, seemed satisfied to let it die a natural death.

Interest in irrigation did not, of course, disappear with the Huffman bill. The dream, aptly stated by a Helena editorial, remained. After berating Montana pioneers for their shortsightedness and pessimism, the writer predicted that

The bloom of the flower is reserved to perfume the existence of those who waited in comfortable eastern homes for the allotted time. These wise people will secure at almost no cost the despised valley lands. They will put on them a supply of water and proceed to raise crops the like of which no other country can equal. Others in great numbers will follow, values of land will increase with the demand, great cities will spring up, railroads will gridiron the country, wealth rapidly multiply and the new settlers become so engrossed in managing their easily acquired fortune that they won't stop even to ask where the poor pioneer is buried. . . .<sup>105</sup>

The dream remained, but the Panic of '93 thwarted its immediate realization. In July Frank Sizer wrote to F. H. Newell, "I find things rather dull in Helena, many of our largest silver mines shut down and all lines of business depressed in consequence thereof. No large irrigation enterprises are even talked, . . ." "Owing to the low price of silver and the prospect of free wool," H. B. Davis did not attend the Society's annual meeting in 1894. By the following December James MacFarlane was suggesting that the engineers act on "some practical matters, such as the free and unlimited coinage of silver; . . ." <sup>106</sup>

In January 1894 the Society responded to the depression by cutting annual dues to \$6. for non-resident members and \$8. for those living within thirty miles of Helena.

A second financial issue concerned the Journal of the Association of Engineering Societies. Late in 1894 the Association entertained suggestions to cut publication costs. It estimated the maximum price for 1895 at \$3.00, but the Western Society of Engineers was not satisfied. April 16, 1895 the Chicago organization circulated a letter

claiming that the Journal would cost \$5 that year, and solicited support for limiting the size and scope of the publication. The Montana Society replied that the accusation was premature. Apparently the associated societies agreed, for in October the Western Society withdrew from the Association.<sup>107</sup>

In spite of economic dislocations of the mid-nineties, the Montana Society of Civil Engineers displayed more activity in legislation and publication than it had in the good years of 1890-92. Ex-President W. A. Haven, writing in 1902, recalled the annual meeting of January 1893.

. . .and was it 9 years ago that we held the remarkable meeting sitting all cramped up in the seats of the high school boys & girls and had almost continuous sessions from 10 a.m. until past midnight and not a drop to drink nor morsel to eat (at expense of Soc) but plenty of cigars--that meeting was the beginning of our assured success--for it called attention of the State officials from Governor to Representatives that we engineers dared to discuss freely--and publish our discussions--any matter that in any way concerned engineers of any class, or surveyors. In fact it made us a state society instead of merely a Helena Club--. . . .It made very little difference whether or not we carried through the Legislature the bills we requested--so long as we got our Society recognized by the Legislature and the people, as a public forum to be respected and consulted. . . .<sup>108</sup>

Haven referred to the debate on the Huffman irrigation bill, but the 1893 meeting covered numerous topics ranging from a paper on plumbing a mine to George Foss's comparison of transcontinental railways. In the evening session A. M. Ryon discussed "Engineering Education in Montana." The School of Mines at Deer Lodge was the only

technical school in the state, and "the youngest mining school in the United States." In spite of Montana's inadequate high school system which retarded preparatory work and the School's limited budget and cramped laboratory quarters, Ryon felt that the well-rounded curriculum, good equipment, and personal attention insured that "the quality of the work done will compare favorably with that of any of the engineering institutions of the United States."<sup>109</sup>

Ryon was followed by E. S. McNeill, who described technical details of lining the Boulder Tunnel. The timber lining had to be replaced with brick and masonry, but irregular geologic composition caused frequent slides, which hindered the work and interrupted scheduled trains. McNeill, who had been Assistant Engineer in charge of construction, presented elaborate diagrams and detailed statistics of the project.<sup>110</sup>

Next F. P. Gutelius detailed the "Construction of the Wooden Pipe Line for Butte City Water-Works." The nine mile pipe was built of 1½" redwood staves, held in position by ½" rods. The paper, accompanied by photographs and profiles of the pipeline, recounted construction techniques.<sup>111</sup>

Throughout the next three years members of the Montana Society wrote and presented a number of papers, dealing primarily with the topics of railroad construction and irrigation. In March of 1893 E. H. Beckler described location of the Great Northern Railway from

Fort Assinniboine to Everett, Washington. In 1894 H. C. Relf discussed the "Masonry Lining at Mullan Tunnel," which had presented problems similar to Boulder Tunnel. In February 1895 Beckler recounted the construction of a narrow-gauge railway carrying ore from W. A. Clark's United Verde mine at Jerome, Arizona to the Santa Fé, Prescott and Phoenix Railway.<sup>112</sup>

Elbridge Beckler's work on the Great Northern led to his election as the Society's first honorary member. When completion of the railraod was celebrated in June of 1893 Beckler's contribution to the efficiency and economy of the line was not mentioned. "The energy that commands a great work to be done," John Herron asserted,

is entirely different from the energy that determines the best manner of doing the work. The result depends on the united energies; but in the glitter and pomp attached to the purpled chariots in their triumphal march the populace see only the energy that commands it.

In recognition of his engineering ability, and as a protest against public disregard for technological skill, the Society elected Beckler to honorary membership.<sup>113</sup>

In his letter of acceptance, read October 14, 1893, Beckler reflected on the growth of Montana, and of the Montana Society of Civil Engineers.

The old expression that the progress of Engineering marks the progress of the World, is especially true of Montana.

In 1886 you will remember that the N.P.R.R. went directly through the territory, with only a branch to the National Park, and another to Wickes. The Union Pacific had a connection to Garrison with a narrow gauge.

Today the Railway mileage within Montana has been multiplied by three, with one-half this increase due to the development of mines of gold, silver, copper, lead and coal, properties all requiring attention from your members.

Among the first institutions of learning for which there was need in the State, was the School of Mines educating younger men to help carry on the work of development.

When your Society was organized I believe there was but one irrigating ditch in the territory (Clarks at Billings) which had required the services of an Engineer, or any instrument in its construction, except a gun barrel.

Today you can see many canals completed, and many of your members engaged in advancing such works.

The greatest future work of the Engineer of Montana will be the building of such dams, reservoirs and canals, as will cause thousands of square miles to be brought under cultivation by a bountiful water supply from the numerous rivers, until the whole state shall become covered with farms, and shall take a leading place among the agricultural states of the Union.

This great work of the future can only be brought forward under the careful direction of competent Engineers with whom the capital for such enterprise can be safely entrusted.

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Interest in massive engineering projects had been growing since the '80's, but the Society's proceedings indicate a lack of technical knowledge. On April 8, 1893, A. E. Cumming presented a paper on the West Gallatin Canal. He discussed the questions of evaporation, seepage, and the amount of water necessary to irrigate Montana lands. In November the Secretary read a paper by Charles Tappan concerning irrigation in the Livingston area. Tappan indicated a dissatisfaction with current optimistic predictions. He criticized newspaper articles which assumed that "where there is so much water and so much land, all the water will some day be placed upon the land and a country of great agricultural value will result." Tappan cited instances demonstrating

the engineering problems of proposed irrigation systems. Irrigation along the Yellowstone was hindered by the high bluffs framing the valley, requiring ditches up to 150 miles long to reach the fertile plateaus. Below Custer Station the fall was too slight and the valley too narrow "to attract would-be canal builders to invest large sums." Tappan recommended utilization of mountain streams rather than the river.<sup>115</sup>

Following discussion of Tappan's paper, George Reeder introduced some questions regarding water measurement under Montana law. The measuring box, as defined by Montana statute, must have an opening six inches deep and a slide to adjust the width. The flow of water in miner's inches was equivalent to the product of the sides of the opening. The water above the box "shall be brought to an eddy, and shall stand three inches on the headgate and above the opening." Reeder's questions concerned the consistency of construction and measurement of the statutory box, the quantity of water necessary to produce crops, and "the duty of water in Montana." A questionnaire on the subject was sent to all members of the Society.<sup>116</sup>

After considerable discussion at the annual meeting January 14, 1894, the Montana engineers agreed that the law was ambiguous and contradictory. Reeder noted that

the ordinary coefficient of discharge is about 62% of the theoretical discharge, and it has been determined, by the authorities, that by varying the shape of the orifice, and making

it either straight, converging or diverging, that the coefficient will vary from 40% to 140% of the theoretical discharge.<sup>117</sup>

In addition, it was impossible to maintain three inches of water above the opening, especially with increasing width. Proportionate allocations in miner's inches did not yield proportionate amounts of water. Western states used at least twenty-four different miner's inches, and the most obvious solution was to alter water measurement to cubic feet per second. A. M. Ryon, professor at the new land grant college at Bozeman, was appointed a committee on water measurement.<sup>118</sup>

Ryon's report, read November 14, cited experimental evidence of the legal standard's defects. For example, the appropriator of 180 miner's inches received 5.64 times the quantity of one claiming 36 inches. Variations in the shape and thickness of the orifice yielded even greater discrepancies, leading to litigation and preventing collection of accurate data on irrigation practices. In conclusion, Ryon proposed an act making a cubic foot, 7.48 gallons, the standard of measurement. One hundred miner's inches would equal 2.5 cubic feet, or 18.7 gallons per second.<sup>119</sup>

The Society presented the bill to the Fourth Montana Legislature in 1895. It was introduced in the House by Alderson and in the Senate by Hoffman, both of Gallatin County. The Hoffman Bill passed the Senate on February 2, with little or no opposition. On the seventh, Deer Lodge petitioned the House against any change in water measurement. On the twelfth Ryon appeared before the House Committee on Irrigation,

as he had done previously before the Senate Committee of the Whole, to explain provisions of the act. Three days later the committee recommended indefinite postponement, but a minority report emphasized the need for a specific standard of measurement.<sup>120</sup>

Public opinion was strong, though divided. In response to the Deer Lodge petition, "R." of Bozeman wrote to the Independent,

In view of the constant bickering between neighbors taking water from the same stream, to say nothing about the occasional shotgun patrol, it certainly sounds a little funny to hear the expression, "general satisfaction," quoted in connection with our measuring boxes.

He pointed out the absurdities of measuring a claim of 6000 miner's inches, requiring a box six inches deep and one thousand inches (83.3 feet) long, with a three inch head over the entire opening. In conclusion, he assured his readers that "The Montana Society of Civil Engineers have no self-interest in this matter; they desire to see Montana keep a pace with the times, and utilize to the best advantage her water supply."<sup>121</sup>

A few days later, another reader refuted the Helena Herald's claim that ". . .as the courts have already decided on a standard of measurement, any change would result in much confusion and damage to irrigation throughout Montana, . . ." He explained that an impossible method of measurement does not constitute a standard, and used the example of the statutory box for 6000 miner's inches. Farming communities in Prickly Pear and Gallatin Valley ignored the practical

arguments and careful reassurances, and petitioned the House in opposition to any change. On February 28, after more than an hour's debate, the bills on water measurement were postponed indefinitely.<sup>121</sup>

In addition to the act on water measurement, the Society presented two other bills to the 1895 Legislature. One concerned the duties and salaries of county surveyors; the other amended Montana statutes on construction of roads and bridges and on collection of road taxes. As so often happened in the West, legislation had been modeled after that of Eastern states where the environment was totally different.

"The present 'road laws,'" reported the MSCS Committee,

seem to have been made up from various statutes of some of the Eastern States, where the counties were small in area, and it was supposed that all of the Commissioners were personally acquainted with all parts of the county, and these statutes are not at all adapted to Montana, where all the conditions are entirely different, and it is physically impossible for the Commissioners to know anything about the wants of a district distant from the county seat, but in these cases they are dependent upon reports made by the road supervisors, few of whom have any technical knowledge or experience in making good roads or keeping them in repair. . . .

The Committee recommended putting all repairs and construction under the supervision of the county surveyors, abolishing the system of "working out" taxes, and providing for detailed annual reports by the county surveyors.<sup>122</sup>

At the annual meeting January 12, 1895 members of the Society, legislators, county commissioners, lawyers, judges, and surveyors discussed the proposed bills at length. F. H. Ray, representative of

the League of American Wheelmen, who had instigated the Good Roads movement, vigorously supported the committee. In a letter to the Independent January 31, 1895 he explained that fourteen states had approved reform legislation. All agreed on two particulars, first that road taxes should be paid in cash to avoid inferior construction by unskilled labor; secondly, that all work should be supervised by either a state or county engineer. At this time Montanans paid over \$300,000 a year to build and repair roads, but the results were extremely unsatisfactory.<sup>123</sup>

A week later, to satisfy the skeptical, "H." itemized expenditures by counties and elaborated on the problem. Roads were used as ditches to carry off excess irrigating water; mountain roads were little more than rough ungraded tracks; and farmers were too busy to "work out" taxes in the early spring when the roads most needed attention.<sup>124</sup>

The remedy as presented by the Society made the county surveyor responsible for maintenance of all roads and bridges in the state, gave him a salary based on the county's assessed value, and required cash payment of all taxes. The surveyor was to be elected for a two year term, and he was to post a \$3000. bond. To avoid legal complications the Society presented two bills, one to amend the laws on county surveyors, the other to revise the chapter of the Statutes relating to roads.<sup>125</sup>

Shropshire introduced the bills in the House, Babcock in the Senate. Both acts were indefinitely postponed by the Senate. However, an amended House Bill 356, which concerned road taxes, and a substitute for House Bill 124 requiring competent supervision of construction and repairs, passed the Legislature. Road supervisors, appointed for one year by the county commissioners, administered county roads under the direction of the county surveyor. Taxes could be paid in cash, but worked out if necessary. The county surveyor was paid \$5 per day, half the amount desired by the Committee, to survey and plat highways.<sup>126</sup>

While the result was less than satisfactory, Ray assured the Montana Society that the bills were at least

a step in the direction of securing good roads without additional expense, and that by carrying on a "campaign of education" we would in a few years be able to obtain the proper legislation to put the location and construction of our highways in the hands of men trained to the work.

Letters from Legislators Babcock, Shropshire, and Craven, thanking the engineers for their efforts, provided additional consolation.<sup>127</sup>

Two other issues particularly interested surveyors in these years. The first was a decision of the Interior Department that deputy mineral surveyors could practice in only one district. The action severely curtailed those surveyors with commissions in both Montana and Idaho, and the Montana Society petitioned the General Land Commissioner to reverse the decision. Commissioner Stone refused

to reconsider, but a year later Interior Secretary Hoke Smith reversed the ruling, allowing deputies to work in more than one state.<sup>128</sup>

The second issue concerned continuing reform of public land surveys. In 1894, Interior Secretary Smith advocated placing all surveys under the geological survey. This would save time and expense and prevent fraud in making contracts with deputies. It would simplify the transfer of reports and revised contracts among land offices, the surveyors general's offices, and Washington. It would eliminate the need for examinations in the field, and abolish the office of surveyor general. The area was already covered by the topographic parties of the geological survey; adding rectangular platting to their duties would save the time and expense of repetitious surveys. The bill was introduced by Representative Dockery on January 14, 1895, and referred to a Joint Commission of Congress.<sup>129</sup>

Early in January 1895 Frank Sizer wrote to several deputy surveyors, alerting them to the proposed bill. Many of the Society's members were public land surveyors; the Dockery bill challenged their reputations and threatened their livelihood. Sizer urged, as a solution, the reelection of T. C. Power.

The Montana Senator sat on the Committee on Public Lands to which the bill would be referred. "It would therefore seem to me," Sizer wrote, "that if the Deputy Surveyors expect to maintain their

position before the Senate Committee, that they should make sure that they have a strong friend and advocate on the committee."<sup>130</sup>

The Montana Legislature sent Thomas Carter rather than Power to the Senate, but it also sent a joint memorial opposing the Dockery bill. Because of the surveyors' efforts, legislative petitions, or for other political reasons, the bill was tabled. Surprisingly, the Montana Society had no part in its defeat. The omission of an official protest was remarkable, because the organization had been deeply involved in local, state, and federal issues concerning engineers since its inception.<sup>131</sup>

Traditionally, the engineering profession had avoided public controversy and political intervention, but the Montana Society of Civil Engineers displayed little reticence. In January of 1894, W. A. Haven addressed the Society on the status of the profession, pointing out that engineers were not consulted (a common complaint) because they refused to participate in public affairs. This was less true, he noted proudly, of the Montana Society.

The men who in thirty years have made this State what it is, men who have developed these mines, built these smelters and mills and reduction works, and who have made these beautiful cities where twenty-five years ago there were but barren hillsides and valleys and gulches, these men are not ignorant of what a civil engineer is, but, on the contrary, when any question of public interest arises, they look to the engineer, hoping to be informed about the engineering law. The Montana Society of Civil Engineers is respected by the public, and only last winter, when an important question was before the legislature, dozens of its members asked me: "What does the Montana Society of Civil Engineers think of this proposed law? . . ."<sup>132</sup>

## CHAPTER 6

### "THAT FITTING RECOGNITION OF THE CONDUCT OF PUBLIC AFFAIRS:" COUNTY SURVEYORS AND A NEW ROAD LAW, MINERAL SURVEYORS AND EXPERT TESTIMONY 1895-1899

In March of 1895 F. H. Ray had assured the Montana Society that a "campaign of education" would persuade the public to abolish road supervisors, require cash payment of road taxes, and make county surveyors responsible for construction and maintenance of county roads. His prediction was partly fulfilled in 1897, when Representative Bruffy introduced H. B. 266 to eliminate supervisors and put road work under county surveyors. With minor amendments, granting county commissioners more power over the surveyor and limiting the latter's wage, the bill became law. The act directed the county surveyor to divide the county into districts; to define and map all public highways in the county; to plan, construct, and maintain all county roads and bridges; and to supervise and examine all contracted work. He had power to hire labor costing less than \$100. without consulting the county commissioners, but must keep careful records and make quarterly reports to the commissioners. The surveyor was paid a \$5. per diem, limited by a total based on the county's size.<sup>133</sup>

House Bill 230, passed by the same session, provided for but did not require cash payment of road taxes. All able-bodied men between the ages of twenty-one and forty-five must pay \$3. cash or an eight-hour

day's labor, on or before October 1 of each year. The county assessor was empowered to collect unpaid taxes from employers.<sup>134</sup>

At the regular meeting of March 13, the Montana Society commended the Legislature for "having taken the initiative in the United States of placing the construction and maintenance of the roads and bridges of the respective counties under the supervision of the county surveyor. . . ." It further recommended that Lewis & Clarke County Surveyor John W. Wade call a meeting of county surveyors to discuss the best means of implementing the law. Wade had been an organizing member of the Society, and most of the county surveyors were members. The meeting was called for March 30 in Helena, but heavy flooding the week before kept many surveyors at home repairing roads.<sup>135</sup>

The Montana Society met on the eve of the convention. It accepted a paper by M. S. Parker on the new road law, and asked Representative Lewis Penwell to prepare an opinion on the law. At 10 o'clock on March 30 the county surveyors and commissioners met in Wade's office. Wade addressed the session, pointing out that "our greatest trouble,--to prove this law a wise one,--will be in these first years." He saw the greatest opportunities, and problems, in determining the permanent location of roads. He recommended topics for consideration: road oversight, apportionment of work, machinery, forms and records, road machinery, road-tax workers, grades and drains, and county accounts.

Representative Fred Whiteside took the chair and appointed committees on the suggested topics.<sup>136</sup>

That afternoon, after an informal discussion, A. S. Hovey reviewed the Society's efforts for the new law. In January 1893, county surveyors who were not members of the organization requested the Society's help in increasing surveyors' compensation. A committee prepared a bill increasing the per diem from \$7. to \$10., but it was never presented to the Legislature. In October of 1894 another committee was appointed, which recommended that county surveyors supervise county roads. The bills introduced in the 1895 Legislature passed, but were drastically amended.<sup>137</sup>

In 1897 the Society prepared H. B. 266 and 280, both of which passed "substantially as framed by the Society," except for amendments to H. B. 266 which decreased the surveyors' wages to \$5. per day, with no provision for traveling expenses. In some cases, Hovey noted, travel costs would exceed the per diem.<sup>138</sup>

The Society, recognizing the bills as the best they could hope for, were determined to prove the need for specialized training to supervise road work. M. S. Parker predicted that the engineers would be hindered by the road tax law, which allowed unskilled labor one day a year. He added that "the perfection of road laws is not to be accomplished in a single legislative session. We must take the laws as we find them, and make the best use of the opportunities afforded

thereby." Parker discussed plans for Cascade County, of which he was county surveyor, particularly in establishing grades for the main roads leading out of Great Falls. Little-used roads would be gradually improved, eventually assuring the county of good roads. Discussion centered around the road tax law and the importance of proper grades, especially for freighters.<sup>139</sup>

That evening Representative Penwell, an attorney, discussed the act's legality. Under the Montana Constitution, compensation of county surveyors could not be increased or decreased during their term of office, but duties could be added. Attorney General Nolan interpreted the law to mean that surveyors would be paid the \$7. per day of the old law, with no additional compensation for work on county roads. The Society decided to bring the matter into court, if possible, but it never reached the Supreme Court.

Next the Committee on Surveyor's Accounts reported, recommending that road construction be carried on like railroads. The county surveyor would supervise an entire county, and would appoint managers as "resident engineers" to take charge of short segments. The surveyor's office would have jurisdiction over all data, plans, estimates and accounts. The county would benefit from a unified system of roads. The surveyor would be directly accountable to the county commissioners, just as a railroad's chief engineer reported to the board of directors.<sup>140</sup>

A cohesive system of roads was needed, not only within counties, but throughout the state. Road location had been determined by county commissioners and road supervisors, so intercounty connections were not always efficient. Cooperation among counties might yield an effective system of direct highways between important points. Lack of grading also created a problem. H. B. Davis complained that in Deer Lodge County "The plowing has been done so near the wagon-tracks that the roadbed has to be filled in even before the freshets come." The Committee on Road Machinery recommended an Austin road machine, which made a grade  $2\frac{1}{2}$  feet above the bottom of the ditch.<sup>141</sup>

In its final session the convention discussed plats and records, agreeing that they should be uniform throughout the State. The committee requested more time for a final report, and after a discussion of grades and drains the convention adjourned. "The meeting," the Society's minutes noted, "was a successful one, and will, it is believed, result in better roads for the state."<sup>142</sup>

The following July Society members were encouraged to send the secretary any articles concerning county surveyors, roads, or any other engineering matters which appeared in local newspapers. In January 1898 F. H. Ray, representative of the League of American Wheelmen, presented the Society with two books on county roads. Flathead County Representative Whiteside spoke on centralized planning for a state system of roads. Whiteside advocated use of convict labor, urged

establishment of a state highway commission, and added that he hoped "the time would soon come when a wheelman can ride across Montana without carrying his wheel a large part of the distance." The subject was referred to the committee on a state engineer, but nothing definite was done. Frank Sizer, writing to F. W. Blackford the following October, advised that "we may as well let it alone, at least for the present."<sup>143</sup>

When, in 1899, Senator Myers of Ravalli introduced a bill to repeal the 1897 law, the Society made no protest, either officially or in the minutes of its meetings. The Independent commented that

The necessity for some such bill has been recognized in all parts of the state. Every board of county commissioners in the state condemns the present law as being altogether inefficient and the county surveyors themselves are not altogether pleased with it.

The same day, January 4, Representative Johnson gave notice of a bill for election of road supervisors. Johnson, a physician who traveled extensively, claimed that the roads of Carbon County had never been as bad as in the past two years. A month later Representative Sands introduced another road bill, which provided for the election of supervisors and defined their duties.<sup>144</sup>

Late in February Representative Jacqueth gave notice of a bill to abolish the office of road supervisor, and J. M. Conrow introduced H. B. 169 for the same purpose. The Conrow bill was indefinitely postponed as contradicting the bill already before the Legislature.

Jacqueth apparently didn't introduce his bill. Valley County Senator A. W. Mahon introduced a bill for the collection of a special road tax, but it was drastically amended. Jacqueth and Mahon were members of the Montana Society of Engineers, as well as county surveyors. These may have been the organization's attempts to salvage part of the 1897 law, but if so they were unofficial.<sup>145</sup>

The Myers and Sands bills were indefinitely postponed, but a substitute for the Johnson bill passed on the next-to-last day of the session. The new law placed the responsibility for roads with supervisors elected for one year terms. The supervisor posted a \$500. bond and was paid \$3. for each eight-hour day of actual work. The new tax law, a substitute for Mahon's bill, reduced the tax to two dollars. It required the assessor to seize and sell property to pay the tax if the individual refused to pay it or to work it out.<sup>146</sup>

A few days after the Legislature adjourned Attorney General Nolan issued an opinion claiming that the new law was unconstitutional because it decreased the compensation of county surveyors elected in 1898. In 1897 House Bill 266 had been challenged because it increased the county surveyors' wage, but Nolan had concluded that it instead gave additional duties, with specific compensation for those duties. Since the new duties were "foreign to the office of county surveyor it was within the authority of the legislative power to describe compensation for duties thus performed." The 1897 law, however, redefined

the duties of county surveyors to include road work, so the 1899 Legislature did not have constitutional authority to decrease those duties and the attendant per diem.<sup>147</sup>

In July of 1899 Charles F. Donyes, county surveyor of Granite County, challenged the new law. Donyes claimed that the county commissioners' refusal to allow him to perform duties pertaining to county roads violated Section 31, Article V of the Constitution by decreasing emoluments of a public officer. The Montana Supreme Court, however, decided that since the duties were compensated by a per diem, rather than a salary, the law transferring duties to road supervisors was constitutional.<sup>148</sup>

Donyes was not a member of the Montana Society, nor did that group indicate any awareness of the suit. On March 11, 1899 Francis W. Blackford read a paper on various types of roads and pavings. He commented that road construction and maintenance should be supervised by a state official, but his recommendation was not applied to Montana. With the failure of the 1897 law, the Society appears to have abandoned the good roads movement.<sup>149</sup>

During the late 1890's the Society's interest in public land surveys also declined. Most of the accessible land had been surveyed, and deputy surveyors found more profitable employment as county surveyors, city engineers, irrigation advisors, mining engineers, or mineral surveyors. In May of 1897 Charles Tappan, who had moved from

Livingston to Salt Lake City, sent the Society a paper on "Surveying Mineral Claims." Tappan discussed equipment, formulas, and sources of error in surveys. He recommended careful checking of observations by double chaining each line and by triangulation to verify long lines.<sup>150</sup>

John Herron differed from Tappan on some specifics, but he praised the paper as an expression of improved standards, since it had "long been customary to consider accuracy non-essential" in mineral surveys. "There is no gainsaying," he added,

that the official survey of a mining claim should be exact--not an approximation. It is useless to lay down rules which give results that are "close enough." Those of us whose work has led into the projection of the boundary lines of claims to the lower levels of deep mines, know what a few feet may mean in the proximity of an ore body.<sup>151</sup>

As Montana's mineral interests grew and mining operation became more elaborate, mine owners and operators demanded increasing accuracy of mineral surveys. Throughout the 1890's engineers and investors recognized Butte's copper potential. Fluctuating silver prices renewed interest in new gold deposits and in reworking of abandoned claims. More efficient chemical treatments particularly the cyanide process, encouraged mechanical methods of gold mining such as dredge mining in Grasshopper Creek and hydraulic sluicing near Garnet and Drummond.<sup>152</sup>

Revived activity in placer mining, as silver prices declined and mines closed, probably accounted for much of the popular interest in geology. On June 26, 1897 Professor L. S. Griswold, Helena geologist and a new member of the Montana Society of Engineers, gave a public

lecture on Helena geology. The presentation illustrated geologic events with familiar landmarks linking ridges or outcroppings with composition and geologic epochs. The Helena Independent reprinted part of the lecture, with the comment that "It was a practical talk to practical men, for the audience was composed of many of the leading citizens of the city who are not members of the Society." "Practical," in this context, meant economically useful in the location and development of mining properties.<sup>153</sup>

Economic justification extended to U. S. Geological Surveys. Following Griswold's lecture R. H. Chapman summarized the Survey's work in the state. Since 1882 the surveys had covered over one quarter of Montana's total area, and several teams concentrated on the mining districts. Throughout the late '90's Walter Harvey Weed, U.S.G.S. geologist who joined the Montana Society in 1897, lectured and published extensively on mineral deposits of the Treasure State. In June of 1898 he spoke before the Society on the geology of Butte, but the lecture differed in approach from Chapman's talk the previous year. Weed's discussion of Butte's complex mineral structure was highly technical, directed toward the growing number of geologists hired by the mining companies to trace the rich, faulted veins underlying the "richest hill on earth."<sup>154</sup>

The peculiarities of Western geology had led to numerous court cases under the "apex law," which stated that a mine owner could claim

the ore in all veins which surfaced on his property. Mineral deposits in the Rocky Mountain districts seldom formed continuous veins: they were faulted or splintered into "horsetail" formations. The Drumlummon, a rich gold and silver mine in the Marysville district, was involved in litigation for twenty-four years. Butte was the scene of a series of court cases. At the turn of the century F. Augustus Heinze severely hampered the Anaconda Company's operations through successive injunctions and trials over ownership of profitable mining properties. Members of the Society were actively involved as mine owners, managers, geologists, and expert witnesses. Mining engineers blamed the problem on the apex, or extralateral rights, provision. In 1897 the International Gold Mining Convention appointed a committee on revision of United States mining laws.<sup>155</sup>

In the fall of 1897 the committee, of which W. A. Clark was a member, recommended abolition of extralateral rights. Claims would be bounded by straight lines on the surface, and by vertical planes extended down from these boundaries. The proposal met with the approval of men like R. W. Raymond, secretary of the American Institute of Mining Engineers, who had served as a witness in the apex cases. Mine owners and managers who had lost considerable time and money when mines were closed pending litigation also endorsed the change.<sup>156</sup>

The Montana Society of Engineers eschewed the controversy over mining law, but reacted promptly and vocally when fees for mineral

surveyors were threatened. On January 3, 1899 in the U. S. Senate, Pettigrew introduced an amendment to the Sundry Civil Expense Bill limiting the compensation to \$7. per day, or \$30. per claim. The Society objected that the bill was unconstitutional class legislation, and economically unreasonable. Present fees ranged from \$10. to \$15. a day, and some claims took three or four weeks to survey and plat. Also, the fee was not paid by the federal government, but by the claimant. "If the bill could be enforced," contended Deputy Surveyor Chase, "it would not secure the object supposed, as it would result in driving all responsible deputies out of the business."<sup>157</sup>

The subject of compensation was always a sore point with the engineers, who felt that they were professionals comparable to doctors or lawyers. In January of 1896 James Keerl pointed out that both the legal and medical professions had attained "their well earned recognition and their fitting emoluments." Engineering, which did not depend on illness or unhappiness but brought benefits to mankind, should be even more richly rewarded. Instead, because of their lack of aggressiveness, engineers were treated as subordinates and paid accordingly.<sup>158</sup>

M. S. Parker, speaking at the annual meeting in 1897, attributed the lack of status to the practice of competitive bidding. "How many reputable attorneys or physicians would so lower their professional standing as to enter into any such competition?" he asked. Yet

engineers increasingly bid against one another, depressing and demoralizing the profession, and degrading their status in the public's estimation.<sup>159</sup>

In 1897 the Montana Society petitioned Governor Robert B. Smith, expressing the

hope that during his administration the engineering profession may receive the fitting recognition in the conduct of public affairs which its importance and usefulness to the proper development of the resources of the state would appear to demand.

The engineers particularly wanted appointment to state boards such as the Arid Land Commission and the Capitol Building Commission, but their requests were largely ignored by Montana politicians.<sup>160</sup>

## CHAPTER 7

### "TO MAKE AN INTEREST UPON CAPITAL:" HYDROELECTRIC POWER AND THE NEED FOR A STATE ENGINEER 1895-1899

In the mid-90's a new challenge confronted the Montana engineers, the building of dams and reservoirs to supply hydroelectric power to cities, mines, and smelters. On April 13, 1895, J. H. Farmer read a paper which compared the costs of stream and water power, and considered the feasibility of a dam across the Missouri River from which power would be transmitted to Helena. In June a paper by M. S. Parker of Great Falls analyzed stream and water costs, claiming that there was "no reason why, in the near future, every town and mining camp in Montana should not have its electric power station supplying all power for lights, street railways, and the running of machinery for all purposes."<sup>161</sup>

The Farmer paper was circulated among the members, and discussed at the annual meeting of January 11, 1896. Although members disagreed with Farmer on certain items, claiming his estimates were too low, all concluded that water power would soon replace steam, particularly in mountainous regions. Additional objections concerned the economic wisdom of building a 4500 horsepower plant, when current usage for Helena, East Helena, Marysville, and Winston totaled only 2000 horsepower. W. C. Sterling added, "I am a warm friend and advocate of the Missouri River Dam, but it must be carried out on a strictly business basis."<sup>162</sup>

A year later the Missouri River Dam was a fact. Samuel Hauser, returning from a trip to the East, assured the Helena Independent that he had found investors to not only complete the dam, but also to expand the East Helena smelter to become a major user of the electricity produced. Such confidence on the part of foreign investors was, he added, proof of Montana's bright future.<sup>163</sup>

The public did not view the future so optimistically. Representative Penwell of Lewis & Clarke county introduced a bill in the Fifth Legislative Assembly requiring that any company owning a dam or reservoir whose failure would endanger lives or property must build telephone or telegraph lines to every residence in the threatened area. This would provide a warning system in case the dam should break. The company also must pay \$5000. to the survivors of any persons killed. Five petitioners could require the county commissioners to appoint inspectors to examine a suspect structure and to require building of communication lines.<sup>164</sup>

Ten days later in an interview with the Independent Hugh L. Cooper, engineer in charge of the Missouri River dam at Canyon Ferry, scoffed at the bill and predicted that

no legislature would pass such a law. If they were aware of the enormous fatigue involved in getting money for an enterprise of this kind, they would not begin a systematic endeavor to make the investors sick. As to the stability of this work, the fact that the plans were drawn by Mr. Fanning, of Minneapolis, the most celebrated water power engineer in the country and a man of international reputation, and that all the work is passed upon

by him should be a warranty of the highest kind that there is nothing to fear. Capitalists are not going to put up work of this magnitude without knowing whether it is stable or not.<sup>165</sup>

The paper's editors were not convinced by Cooper's arguments. On March 3 they printed an article from the Denver Republican on "Supervision of Reservoirs," with the subtitle, "Something Needed in Montana as Well as in Colorado." The Denver author opined that engineers were poor judges of a dam's stability. "It is well known," he said, "that engineers seem to be unable to properly estimate the pressure of a large body of water contained in a reservoir." Thus, judging a structure to be safe, the engineers were "the most surprised men of all" if the dam failed. Investors were, of course, readily convinced that additional and expensive reinforcement was unnecessary. The situation demanded inspection by an honest, competent state engineer, with the power to enforce his decision.<sup>166</sup>

The Penwell bill did not pass, but the author's apprehension was justified in April of 1898 when Montana Power Company's dam on the Big Hole River near Divide partially failed. At the annual meeting in January M. S. Parker had assured the Society's members that the dam was perfectly safe.

Mr. Fanning, the consulting engineer, has a world-wide reputation as an hydraulic engineer, and would not be associated with a project that would subject the people to loss of life or property; neither would the company spend half a million dollars in an unsafe structure. Everything has been and is being done to insure perfect construction. Mr. Fanning is also consulting engineer of the

Missouri River dam [at Canyon Ferry], of a similar pattern and design; and both dams are being built in a perfectly safe manner.

Parker went on to explain that a timber crib dam, built of an overlapping log framework filled with fine rock and gravel, was safer than earthen or masonry dams which failed suddenly and completely. He estimated a safety factor of six to one.<sup>167</sup>

The Big Hole dam, one of the highest timber crib dams which had been attempted, was 500 feet long and 60 feet high. The engineers in charge of the project expected high water in late May or early June, but it came six weeks early, before the dam was completed. The sudden pressure settled the gravel filling in the cribs, and compressed the timber framework, allowing the crest of the dam to move outward thirteen feet from the original face.<sup>168</sup>

"It is always interesting to an engineer," remarked Parker, "to investigate the causes of certain results. . . .The structure was pronounced safe by all. Still it failed in an unforeseen way, that experience teaches can be avoided." Since the cribs had been filled during the winter "puddling" to compact the gravel was impractical, and the timbers lacked adequate bearing surface. Parker recommended puddling the entire filling, laying masonry, or using timber blocking to reinforce the framework and resist compression. Diagonal bracing would prevent the rolling of logs which allowed the structure to settle over.<sup>169</sup>

In the ensuing discussion Eugene Carroll, chief engineer of the Butte Water Company, noted that the spillway had been placed in the center. The highwater literally cut the dam in two. E. H. Wilson added that this alteration of Fanning's plan by the company would have been prevented if Montana had a state engineer to inspect and supervise reservoir construction.<sup>170</sup>

Two years later Joseph Harper, engineer in charge of reconstruction on the Big Hole dam, commented on the causes of its failure. He blamed the excessive settling on too fine a filling which was displaced by the water, allowing the larger rocks to shift and settle. Vertical sheeting on the lower face of the dam did not shrink with the horizontal timbers in the cribs. This distorted the aprons' outer edges, and made the failure appear worse than it actually was. The steps of the apron were too narrow, and would probably have been destroyed by "hammering" of the water at maximum overflow. And finally, although the concrete pier designed by Fanning had been omitted, Harper felt that it would have saved the northern end of the dam anyway.<sup>171</sup>

Harper & Macdonald, in rebuilding the dam, left much of the original intact. They argued that it had already settled and compressed, and was bearing a water-level only five feet below the working head. The engineering firm cut a spillway through solid rock at the north end of the dam. They reinforced the upper wall with overhanging cribs which brought the crest within five feet of the original line. The aprons

were bolted carefully into the existing steps, widened, and extended downstream. This precaution was taken because in 1899 the high water was clearing the dam in two leaps, completely missing the intermediate steps. At the maximum, the water measured nine and a half feet over the dam's crest. The flow was estimated at about 18,818 cubic feet per second, three times the maximum in 1898. Harper supposed that the river reached such extremely high levels at about ten year intervals.

Harper's measurements illustrated the lack of data, particularly for spring runoff, on mountain streams. The danger of this deficiency was further emphasized in June of 1898 when the Canyon Ferry dam also partially failed. The dam was of timber crib construction, 485 feet long with a crest twenty-nine feet above mean low water. The apron consisted of three steps to break the fall of water over the dam. The first high water, five feet over the crest struck the first step, jumped the next two, and undermined the lower step. The timber cribs settled over into the depression, and the top of the dam sprang a maximum of five feet out of line.<sup>172</sup>

Fanning blamed the Canyon Ferry dam's failure on deviations from his design. The original plan called for flooring in the base cribs to keep the filling intact. Fanning had not supervised construction, and the flooring was omitted, allowing filling to wash away. In reconstruction the damaged timbers were replaced and the steps covered by

an inclined apron. In 1899 the reconstructed dam withstood exceptionally high water, seven and one-half feet above the crest.<sup>173</sup>

The engineers were cautious in assigning blame, either to designers or to the design itself. Part of the problem was that few dams had been built on mountain streams, so the profession had little empirical knowledge. Measurement of stream flow was inadequate to gauge the pressure a dam would have to withstand, particularly during the two or three months of high water each spring. Montana's unpredictable weather further hampered calculations. Local materials had not been tested for strength, and, as the Society's members often protested, companies altered specifications in their desire for economy.

The engineers were quick to learn from the experience of others, as Eugene Carroll noted in his paper on a dam for the Butte City Water Company. Carroll visited the Big Hole dam, and modified his plans to prevent a similar failure. He lapped, rather than butted, the logs at intersections, and added fillers between timbers to add bearing surface and prevent rolling. He also placed an earthen fill on the back of the dam, though he admitted that leakage might wash it away and cause problems. The fill would protect the timber cribs from fire, but his principal reason had nothing to do with stability. Carroll added, "to allay the fears of the people living below the structure I decided

to put it in partly for effect, as it makes the structure look much stronger."<sup>174</sup>

Two failures within two months did nothing to calm the public's fears. In 1899 Lewis & Clarke Representative E. C. Day introduced a bill for warning systems below dams. The bill was similar to the Penwell proposal of 1897, and the Independent reacted in much the same way, declaring that "Dams of the character of those at Great Falls, Canyon Ferry and Big Hole do not go out without ample warning, and there would be time to fully protect those who would be in the track of the flood." A telephone or telegraph system to each residence within the flood line would be an unwarranted hardship on the companies.

The men who build a dam in this state, for the purpose either of creating cheap power or to store water with which to make our desert lands blossom as the rose, are in fact public benefactors, and instead of adding to their burdens, it should be the pleasure of the state authorities to lighten them, and to render to such enterprises every encouragement possible in the good work so undertaken.<sup>175</sup>

The editorial drew a prompt and heated response from an N. Hilger, detailing the partial failure of the Canyon Ferry dam and charging that the Big Hole dam was in worse condition. He claimed that "hundreds" had petitioned the legislature for such a bill, and ended with a plea to "give us at least a chance for our lives, . . ."<sup>176</sup>

Ironically, in the same legislature the Montana Society of Engineers sponsored a bill to create the office of state engineer, believing that inspection and supervision of large projects such as

dams, irrigation ditches, highway bridges, and public buildings would insure public safety. Repeatedly, in discussing dam failures, massive reservoirs for irrigation, or construction of a statewide system of highways, the engineers asserted the need for a state official with special technical training.<sup>177</sup>

The Society had first introduced the subject in 1889 when they petitioned the Constitutional Convention for creation of the office of state engineer. That effort failed because the delegates considered it a legislative, rather than constitutional matter. In 1891 the engineers discussed a second attempt, but decided it would be wiser to collect information and to inform the public on the need for such an official. The demand should come from the people, so it would not appear as a self-serving plot of the engineering profession. The 1893 discussion of Huffman's irrigation bill included the appointment of an engineer to oversee large-scale projects. The Society included that provision in their resolution to the Legislature, but the proposal died with the irrigation bill.

At the annual meeting in January 1898 Theron Ripley reported on the Missouri River dam then under construction at Canyon Ferry. Discussion turned to the need for responsible supervision of such structures by a state engineer. Hydroelectric plants, irrigation reservoirs, and municipal water works required inspection. Neighboring

states had such an office, and the Society appointed a committee to draft a bill for Montana's state engineer.<sup>178</sup>

The need for a state inspector was dramatically illustrated by the failures of the Big Hole and Canyon Ferry dams in the spring of 1898. But public opinion, rather than endorsing the concept of technical ability and professional accountability, relied on legislative sanctions to guarantee responsible engineering practice. In November of 1898 Frank Sizer wrote to Elwood Mead, Wyoming State Engineer, for advice concerning the bill, and commented that he felt "exceedingly doubtful about the success of the bill, in the coming legislature,

but nevertheless it is our intention to push the matter with all possible energy. We are naturally anxious to have the bill as complete and perfect as possible before introducing it; but, on the other hand, if it involves too many radical changes in the present system of water rights, its chances of success are materially lessened.<sup>179</sup>

The Society presented the bill to Montana Attorney General Nolan for a legal opinion, and then discussed it in the annual meeting, January 12, 1899. In response to Professor William's suggestion that the state engineer be an ex-officio member of the Arid Land Commission, James Keerl recalled the irrigation bill of 1893. At that time the appointment of an engineer to the Irrigation Commission was opposed on the grounds that when an engineer employed another engineer, the two were sure to disagree. The Society replied that conflicts had not developed in the East, where engineers frequently sat on boards, or

between a railroad's chief engineer and his assistants. Eugene Carroll disagreed, but suggested that conflicts might be avoided if the state engineer were chief engineer of the Arid Land Commission. After further discussion the Society amended the bill, allowing the Commission to call on the state engineer for advice. E. H. Wilson, Silver Bow Representative and an organizing member of the Society, was given the final draft for introduction to the Legislature.<sup>180</sup>

The bill, House Bill 28, provided for a state engineer appointed by the governor for a four year term. He must have had five years' experience in civil engineering, or enough theoretical knowledge and actual practice to qualify him for the position. The engineer must file a \$10,000 bond, and was subject to removal by the governor. He was responsible for collecting data, approving plans, and supervising construction or irrigation works. He could supervise and inspect any dam or dyke over ten feet high, excavate to examine the foundation, and order repairs. He would report to the governor biannually, and would act as advisor to the governor and the Arid Land Commission.<sup>181</sup>

A major obstacle to the bill was the engineer's salary of \$4000. per year which was comparatively high, and his power to employ assistants at \$150. per month. State politics complicated the financial issues, as copper magnates W. A. Clark and Marcus Daly battled over Montana's seat in the U. S. Senate. Clark aspired to the office, and Daly determinedly opposed him, supporting W. G. Conrad instead. On

January 20th the committee on irrigation and water rights reported the state engineer bill favorably, and on the 27th the Independent responded with the accusation, "Another Soft Job." The bill was, the Clark paper charged, an attempt by the Daly machine "to get itself on the pay roll of the state." If the state engineer appointed one assistant with a monthly salary of \$150 for each of the twenty-four counties, the cost would total \$47,200. While the paper conceded that some of the duties performed would be beneficial, they did not outweigh the probability of bankrupting the state for the Daly machine's financial gain.<sup>182</sup>

The bill had, of course, been drafted by the Montana Society of Engineers, which could hardly be classified as a Daly organization since its members included W. A. Clark and F. Augustus Heinze, as well as Daly employees. The only apparent link with Daly was the bill's sponsor, E. H. Wilson, whom the Independent labelled "Expert and general surveyor of the Anaconda company." Wilson had consistently voted against Clark in the senatorial race.<sup>183</sup>

Wilson worked hard to keep the bill alive, speaking before the House committee of the whole on its "advertisement for Montana's resources" and following it to the Senate committee on irrigation. The Independent's political charges subsided once Clark was elected, but the Helena paper consistently opposed the creation of a "sinecure," and the Butte Miner rumored a veto if the bill passed. House Bill 28 narrowly passed the House on February 22, but was killed by the Senate

on the twenty-third. Montana was not to have a state engineer until 1903, when the office was created in connection with the Carey Land Act.<sup>184</sup>

The Society's second bill, also introduced by Wilson, was the water measurement act drafted by Ryon, which had failed in 1895. Farmers, fearing extensive litigation and loss of existing water rights, opposed the attempt to replace miner's inches with a cubic foot standard. John Robinson, a Gallatin Valley farmer, expressed his suspicion.

.....  
The statutory measurement of water as is defined in section 1893 has stood the test for a number of years and has given excellent satisfaction to the farmers, litigants and attorneys, and has stood the test in the courts. The simplicity of this method for measuring water, its nearness to accuracy for all practical purposes certainly commends it to everyone who is a user of water requiring measurement.

Bill No. 29, in section 2, says: "Where water rights expressed in miners inches have been granted." ["one hundred miners' inches shall be considered equivalent to a flow of two and one-half cubic feet (18.7 gallons) per second; . . ."] That leaves a grave doubt as to what it refers. Most of our water rights have been granted under the statutory measurement. Before this law was enacted (sec. 1893) water rights were granted as miners' inches under the common law of usages [sic]. A search of court records throughout the state will reveal the fact that the so-called miners inch is a very indefinite quantity, while the statutory inch is definite enough for all practical purposes.

How do the friends of house bill no. 29 know that 2½ feet (18.7 gal.) per second are equivalent to 10 inches of miner's or statutory measurement? These doubts, combined with the difficulties and inconveniences which arise in the measurement of water as proposed by house bill No. 29 and the added fact that the farmers and other users of water are satisfied with the law as it now stands, are ample reasons for the defeat of the bill now pending.<sup>185</sup>

Robinson's defense of the statutory inch demonstrated a basic misunderstanding of the problem. It ignored the objections raised by

Ryon's experiments, which had demonstrated that variations in the statutory box yielded significant discrepancies in the amount of water appropriated. The engineers' primary objection was that the ambiguity of both the Miner's and statutory inch led to disputes over water rights which no expert witness could settle.

In spite of opposition--the Independent referred to the bill as an "engineering fraud"--House Bill 29, establishing measurement of water in cubic feet per second, passed the House on February 21 by a vote of 39 to 22. The Senate amended the bill to provide that previous measurements "shall be measured according to the law in force at the time such decree was made and entered," and passed it on February 24 by a vote of 16 to 6.<sup>186</sup>

The need for a uniform standard of water measurement was magnified by a growing interest in irrigation for the state. Individuals and companies had been building ditches since early territorial days, but the National Irrigation Congresses of the 1890's and passage of the Carey Act in 1894 drew public attention to the potential of massive federal- and state-supported projects. Fantastic prophecies by irrigation "evangelists" encouraged promoters.<sup>187</sup>

Irrigation technology was still in the early stages, and the Society frequently discussed economic feasibility of pumps versus canals, or technical problems of ice and debris. Several members had been involved in developments throughout the state--A. W. Cumming on

the West Gallatin Canal, and Cumming and A. W. Mahon on the federal project of the Fort Belknap Reservation. Others were indirectly involved in irrigation. In 1895 the Butte Water Company diverted Fish Creek across the Continental Divide, cutting off water to several ranches. The Company bought the ranches and, under the direction of Eugene Carroll, built a ditch from the Jefferson River to water the land.<sup>188</sup>

In September of 1898 Elwood Mead, Wyoming State Engineer, who was studying irrigation in Montana for the federal government, gave a public lecture under the auspices of the Montana Society of Engineers. Mead painted a glowing picture of the agricultural potential of Montana, predicting that with the proper use of water Montana could have "as high rank as an agricultural commonwealth as she now holds as a producer of the precious metals." He also advocated a state office to record water claims and a state engineer to measure rivers and streams and adjudicate conflicts.<sup>189</sup>

Although engineers were recognized as technical experts and were consulted on irrigation projects, and several members were appointed to the State Arid Land Commission, the Montana Society felt that the state truly needed a state engineer. The desire for professional status and recognition was still hindered by political realities. In 1899 James Keerl related an interview with Governor Rickards four years earlier. Rickards admitted that specialized training qualified the

engineers for position on state boards, but added that "he had concluded it was better to appoint business men upon these commissions inasmuch as they would have to go forth and secure the money necessary to fulfill these objects.

I asked him whether I was to consider that he regarded engineers as not being business men, and called his attention to the fact that my understanding of the training of an engineer was that his essential quality was to make an interest upon capital. I formed the impression subsequently that our illustrious Governor never made any appointments but for one purpose, and that for political ends, and I have since been sustained in that belief by many members of his own party. Politicians will not appoint engineers upon engineering commissions, or architects upon commission [sic] dealing in architecture, until we force them to it by exerting a political influence.<sup>190</sup>

## CHAPTER 8

### "COPPER IS THE PARAMOUNT FEATURE:" A NEW NAME, A NEW ADDRESS, AND A NEW STANDARD OF MEMBERSHIP 1895-1899

The Montana Society of Civil Engineers had been politically active since 1887, but real prestige did not develop until 1893. After an initial spurt of activity in 1888 and 1889, internal problems sapped the organization's strength. The annual meeting of 1893, with its variety of papers and the heated discussion of Huffman's irrigation bill, marked what Haven called "the beginning of our assured success." But in spite of the burst of activity in papers and petitions, unstable financial conditions persisted, magnified by the depression. Three members resigned and nine were suspended, reducing the membership to thirty-eight. Attendance at regular monthly meetings declined until President W. A. Haven put hats on chairs as proxies to make up a quorum of five.<sup>191</sup>

In October of 1894, probably to encourage the interest of the Butte members, the Society planned a trip to the mining city. On the first day, October 13, nine members and two guests toured the Meaderville mines and mills. The second day's excursion was not so well attended. Eugene Carroll, Chief Engineer and Superintendent of the Butte Water Company, had invited the group to visit the Basin Creek dam site.

I secured all the surreys in town for the occasion, and was very much surprised to find the annual meeting was composed of

Mr. Havens [sic], Mr. Keerl Pres't, and Mr. Baker of Baker & Harper. Next morning I secured a surrey and when the time came to go we could not find the President. After considerable search we found he had indulged too freely the previous night, and had landed in the cooler. We left him there & went on our excursion.

This was, of course, an isolated incident. It must have been unusual, for Carroll recalled it thirty-three years later.<sup>192</sup>

By 1895, in spite of poor attendance and financial problems, the Society could boast of its professional standing. At the annual meeting January 12, retiring President Haven reported that one-fourth of the members were also members of the American Society of Civil Engineers and half of the remainder were eligible. This was no small claim, for the A. S. C. E. maintained high standards of age, experience, and ability.<sup>193</sup>

Haven could also announce that the Society was growing again, both financially and in membership. Thirteen engineers joined in 1894, twelve more in 1895, and a record thirty-seven in 1897. By January of 1899, the Society claimed one hundred twelve active members, eighteen associate members, and four honorary members. Financial conditions improved more slowly. Officers repeatedly complained about unpaid dues, and in January 1898 the Secretary noted that indebtedness was increasing. Most members paid their dues, but delinquents who continued to receive the Association of Engineering Societies' Journal accounted for a past-due bill of \$152.55. John Trautwine, Association of Engineering Societies Secretary, moderated his reminder with the

comment that "Your Society has of late shown such gratifying activity, and has made such progress toward settlement of its account, that I regret to be compelled by the action of the Board to bring the matter to your attention."<sup>194</sup>

Haven attributed the "gratifying activity" which began in 1894 to

the fact that our Society has taken an active part in movements for developing the resources of our State in a practical, scientific and economical manner, and has thus acquainted the people of the existence of our Society and of our ability and readiness to grapple with the problems that must be solved by our people.<sup>195</sup>

A second factor in the Society's growth was its effort to stimulate interest by holding the annual meetings in cities other than Helena. The 1897 meeting in Great Falls revealed the extent to which changing technology had altered Montana's engineering profession. On January 8 the engineers visited the Anaconda Company's coal mines at Belt, and on the ninth toured the smelter, refinery, water and light plants of Great Falls. Retiring President John Herron, Helena mining engineer, commented on the Society's neglect of the mineral industry. Despite a substantial representation of mining and metallurgical engineers "the one industry which has been carried to a most successful outcome in this state has never been noticed in the papers presented to the society."<sup>196</sup>

Although the Montana Society of Civil Engineers had never discouraged discussion of mining technology, in the early years the

organization was dominated by railroad men and public land surveyors. Topics naturally centered around those concerns. In the mid-nineties, as railroads were completed and hasty construction remedied, civil engineers returned to the East or turned their attention to different fields of engineering. The public land surveys had been curtailed, first by reform movements and then by a lack of appropriations. Surveyors turned to city and county offices, to irrigation and water power, or to mining and metallurgy. The men who had begun as "civil engineers and surveyors" became increasingly specialized.

The Society's officers reflected the changing composition of the profession. In 1893 William A. Haven, a Helena railroad engineer and charter member, was elected President. First Vice-President James Keerl was a Helena surveyor. Bozeman engineering professor Augustus M. Ryon, who had joined the Society in 1891, was elected Second Vice President. Secretary George O. Foss and Treasurer Albert S. Hovey, both Helena civil engineers, were charter members. Trustees John Herron and Finlay McRae were also from Helena; Elliott Wilson was a Butte mining engineer. In 1894, Walter S. Kelley, another Butte mining engineer, replaced Herron as Trustee. The others retained their offices.

In 1895 Keerl advanced to the Presidency and Ryon to First Vice President. Hovey and McRae were Treasurer and Trustee. Second Vice President James M. Page of Twin Bridges and Secretary-Librarian Forrest

J. Smith of Helena were both surveyors. Charles Griffith, a Helena civil and mining engineer, and Charles W. Goodale, Great Falls mining engineer, were the new Trustees.

In 1896 John Herron, railroad and mining engineer, was elected President. James M. Page became First Vice President and Adelbert E. Cumming, Helena irrigation engineer, Second Vice President. Hovey, Smith, Griffith, and Goodale retained their offices, and Haven replaced McRae as Trustee.

In 1897 the Society elected Charles Goodale as President and A. E. Cumming as First Vice President. Maurice S. Parker, the Great Falls engineer who built Black Eagle Falls dam, was elected Second Vice President. Hovey was still Secretary, Keerl Treasurer, and McRae reassumed the office of Trustee when Haven returned to New York. Francis Blackford, Butte civil and mining engineer, was elected Trustee to replace Griffith. He and Parker had joined the Society in 1895.<sup>197</sup>

For the first five years all officers of the Society were charter members. All but one had been employed on railroad location and construction or as public land and mineral surveyors. John Gillie, a Butte mining engineer, was elected First Vice President in 1890. Several other officers listed themselves as civil and mining engineers, as employment patterns adapted to changing technical demands.

In 1892 Frank D. Jones, a new member, was elected Secretary. Jones was a railway engineer and surveyor who had been in Helena since

1887. The following year Finlay McRae and Augustus Ryon, who had joined the Society in 1890 and 1891, were elected officers.

In the five years between 1893 and 1898 the Society's offices passed to newer members and to men in fields other than railroads and surveys, some of whom resided outside the Helena area. Changes in membership paralleled the changes in officeholders. From 1895 on the number of mining engineers equalled or exceeded the number of civil engineers joining the Society each year. Other applicants identified themselves as mechanical engineers, electrical engineers, geologists, chemists, assayers, and irrigation specialists. Herron recognized this fact, and in his annual address urged that the organization's name be changed to the Montana Society of Engineers, to accomodate all branches of engineering.<sup>198</sup>

The suggestion was not new; eight years earlier A. B. Knight had proposed the same amendment, which was defeated by a vote of sixteen to fifteen. The "old guard" of railroad engineers had opposed the change, objecting that they would be confused with locomotive engineers. But by 1897 the civil engineers no longer controlled the Society. Herron's proposal met with approval, and the secretary was instructed to send out letter ballots. On February 13, 1897, by a vote of thirty-three to four, the Society's name was amended to the Montana Society of Engineers. The change was reasonable, since the Society had always been composed of mining and mechanical engineers, surveyors, and

architects, in addition to civil engineers. The modification acknowledged the organization's true composition, and encouraged engineers in specialized branches to join the Montana Society.<sup>199</sup>

Herron was careful to point out that the change did not indicate a lowering of standards.

No matter what is a member's specialty--and all engineers of to-day, to be successful, must be specialists--he should be skillful. To make two blades of grass grow where but one grew before; to increase manufactured power, while simplifying the mechanism which produces power; to save time; to save labor--these are the province of the engineer, and in understanding the natural and physical laws which govern the universe he differs from the mere workman.

The Society could serve the profession by dissemination of scientific information and exchange of practical knowledge. Herron felt that the organization's success required "more interchange of opinion."<sup>200</sup>

Active participation was hampered by the size of the state and the fact that Helena, the Society's headquarters, was no longer the center of engineering activity in Montana. C. W. Goodale, a Butte mining engineer, accepted the Society's presidency in 1897 with the comment that he had at first declined the nomination. He would be able to attend few meetings, because the train schedules between Butte and Helena required a two or three day trip for each monthly meeting. Goodale was persuaded to accept the office by assurances that the vice presidents would try to attend all meetings, and by the general feeling that Butte "ought to have a representation in the presidency about this time."<sup>201</sup>

Goodale's appraisal was substantiated by an immediate interest from the Butte engineers, including such prominent mine owners as William A. Clark and F. Augustus Heinze. The annual meeting of 1898 was held in Butte, where the Society's members toured the mines and smelters, the School of Mines, and the Big Hole Dam near Divide. At the business meeting James Page of Twin Bridges was elected President, Maurice Parker first Vice President, and Forrest J. Smith Second Vice President. A. S. Hovey and James Keerl were reelected Secretary and Treasurer. Edward R. McNeill replaced Goodale as Trustee. The minutes of February 12 commented on the "interest and activity of the Butte members." That same day the Society received applications from seven mine managers and superintendents, "4 mining engineers, 2 civil and mining engineers, 2 civil engineers, 2 electrical engineers and 1 architect."<sup>202</sup>

The significance of the sudden influx was demonstrated in January 1899 at the annual meeting in Helena. Eugene Carroll of the Butte Water Company was elected President; Maurice Parker, civil engineer who had built the Big Hole Dam, was elected First Vice President; and Frank Sizer, now a mining engineer, was elected Second Vice President. All were residents of Butte, as was Trustee Francis Blackford. Secretary A. S. Hovey, Treasurer F. J. Smith, and Trustee Finlay McRae were from Helena. Trustee Edward McNeill was engineer in charge on the Montana Central Railway at Boulder. President Carroll

noted that five or six years before the Society had been dominated by Helena residents, but now most of the members were from Butte. He suggested that every other meeting be held in Butte. This would encourage membership and increase attendance, paper presentations, and discussion.<sup>203</sup>

On motion of Helena member Finlay McRae, the President appointed a committee to consider changing the Society's headquarters. E. H. Wilson of Butte, A. S. Hovey of Helena, and C. W. Goodale of Great Falls recommended meetings in Butte every two months, to be conducted like "any regular meeting." At the March meeting in Butte another committee was appointed to amend the constitution, making Butte the Society's headquarters. The Secretary's absence delayed the sending of letter ballots until June. The topic raised little conflict, for by July 8 less than one-half of the members had voted. When the ballots were opened on September 9, 1899, of the sixty-two members voting only six opposed the change. Fifty-six affirmative votes, representing about half the membership, transferred the Montana Society of Engineers to Butte.<sup>204</sup>

Lack of controversy implied that the engineers recognized the increasing dominance of Butte within the profession. Aside from the mining engineers, geologists, and metallurgists of the mineral industry, the Society's membership was largely composed of county surveyors, city engineers, and hydraulic engineers building irrigation

projects and hydroelectric dams. Those men were scattered throughout the state or frequently moved from one site to another. The few railroad engineers who retained their active membership were usually stationed in Tacoma or St. Paul. Butte was the logical location for the Society, and few members were inclined to argue. The move was not the result of a power struggle, but rather an acknowledgment of changing technological demands within the State.

By 1900 Montana had no market for the civil engineer of the 1880's. Engineers had become specialists in irrigation, in electrical transmission, in water supply, or in mining and metallurgy. The Montana Society of Civil Engineers had been actively involved in development of surveying, irrigation, county roads, hydroelectric plants and in the movement for a state engineer. The organization almost ignored developments in the mineral industry.

Montana's mineral potential was recognized early, as placer gold yielded \$31,374,000. by 1868. Transient miners exhausted the placers and moved on, leaving the state to those with the foresight, patience, and financial and technical resources to develop the quartz and silver deposits. Quartz required milling to break up the ore, and complex silver compounds required smelting. During the 1880's Montana was one of the primary silver producers in the United States. In 1887 it led the nation, with \$17.8 million worth of silver. The areas

around Helena and Philipsburg produced most, though Butte yielded a share.<sup>205</sup>

Repeal of the Sherman Silver Purchase Act in 1893 depressed prices and injured Montana's silver industry. A few mines continued to operate, particularly those in which silver appeared along with gold or copper. But 1893 was the last year in which silver production exceeded copper in value.<sup>206</sup>

Between 1893 and 1899, as silver declined, placer mining enjoyed a brief resurgence. Improvements in the cyanide process for recovering gold made hydraulic and dredge mining profitable. Dredge operations between 1897 and 1899 were located on Grasshopper Creek, near Bannack, and the hydraulic placers were scattered throughout the western mountains. Helena was no longer the hub of mining operations in Montana.<sup>207</sup>

In the second half of the decade Butte became the mining center of the state. Butte had begun as a gold camp in the sixties, revived in the silver boom of the seventies and was a world-famous copper producer by 1890. In 1900 the Montana Bureau of Agriculture Labor and Industry reported, "Copper is the paramount feature of the mining industry in Montana. More than 80 per cent of the total values won in the state during 1899 came from the mines at Butte in the shape of gold, silver and copper."<sup>208</sup>

Copper was big business; the expensive equipment and procedures required corporate financing and led to consolidation. The complex ores of the "richest hill on earth" required a sophisticated technology. Mining and metallurgical engineers, chemists, and assayers responded to the challenge. Companies hired geologists to trace the fragmented ore bodies, and to testify in the apex cases which clogged the Silver Bow County courts. Civil and electrical engineers built dams to supply water to the concentrators and power to the refineries. Huge mining corporations demanded, and were able to hire, large numbers of specialists. The engineers gathered in the Butte-Anaconda area, where most of the mines and smelters were located. By 1899 Butte was the geographical focus of the profession.<sup>209</sup>

With the Society's move to Butte other changes in the organization appeared. Mining and metallurgical topics appeared more frequently in the discussions. The annual addresses devoted more time to mining developments. Other specialized areas such as water purity, fuel efficiency, municipal water supply, and electrical transmission received more attention. Membership grew, and the financial status of the organization improved. While the concern for reputation and compensation remained, admission requirements changed.<sup>210</sup>

At the annual meeting of 1901 Frank L. Sizer, newly-elected President, asked the Secretary to read the section of the constitution on membership qualifications. Article II, Section 3 provided that

Candidates for admission to the Society, as members, must have been engaged for at least five years in some branch of engineering or architecture, or have been graduated as engineer or a manager of a railroad, canal or other public work; a geologist, chemist or mathematician; a manager of a mine or metallurgical work; or one who from his scientific acquirements or practical experience has obtained eminence in his special pursuit, qualifying him to co-operate with engineers in the advancement of professional knowledge, but may not himself be practicing as an engineer.<sup>211</sup>

Charles Goodale suggested that the Society create another classification, associate member, to include "those who are thoroughly in sympathy with the purposes of the organization, but who perhaps are not fully qualified under the requirements of the by-laws, . . ."

Blackford reminded him that the constitution already defined as an associate member "any member of the Society who removes from the State and wishes to temporarily withdraw from active participation. . . ." <sup>212</sup>

Eugene Carroll warned that the organization's reputation must be safeguarded.

I do not think a Society of this kind can be too careful with its membership roll as to the living up of the intentions of the Society. As I interpret the constitution, the intention is that this Society shall be composed of engineers. At the same time, there are many people who are closely associated with engineers, and whom we are glad to have associated with us and that would become members of this Society and would be a benefit to the Society. . . .

. . . . .  
. . . I think it would be perfectly proper to call the new class the associate members. This would include machinery men, contractors, and men who have had no technical education and cannot come in under our requirements, men who are not engineers in the broadest sense of the term.

Carroll also recommended that the amount of experience necessary for membership be reduced, to allow young men interested in engineering to become members.<sup>213</sup>

After further discussion Sizer appointed Charles Goodale, Charles D. Vail, and Robert McArthur as a committee to revise the constitution. On March 9 the committee presented its proposal. It classified the Society's members as active, associate, corresponding, junior, and honorary members. Section 2 of the proposed amendment read

An active member shall be a civil, mechanical, mining, electrical or other professional engineer; an architect, geologist, metallurgist or analytical chemist. He shall have been in active practice of his professional work for at least four years, and shall be qualified to design and direct engineering work, or capable of carrying on the work of his profession. Credits from a school of recognized reputation in the above profession shall be considered as equivalent to one-half the time they represent as active practice. The performance of the duties of a teacher in schools of high grade in the above professions shall be accepted as equivalent to an equal number of years of responsible charge of professional work.<sup>214</sup>

The committee added the new classification of corresponding member, and redefined associate membership. The corresponding member was roughly equivalent to the former associate member, one living outside the state who could not actively participate. The new associate member

shall be a person who by scientific acquirements or practical experience has attained a position in his special pursuit qualifying him to co-operate with engineers in the advance of engineering knowledge or practice.<sup>215</sup>

In April of 1897 the Society had discussed protecting its standards by changing the title of associate member to corresponding member and creating a new category of associate member for those "qualified by practical experience to co-operate with engineers. . ."

The change had been rejected in 1897, but in 1901 the Montana engineers were more receptive to the idea.<sup>216</sup>

The associate membership was similar to a classification of the American Institute of Mining and Metallurgical Engineers which admitted mine owners and other entrepreneurs associated with the mineral industry. The A. I. M. E. had the lowest membership requirements of the national engineering societies. The other organizations, particularly the American Society of Civil Engineers, were critical of the mining engineers' admittance of non-professionals.<sup>217</sup>

Within the Montana Society of Engineers, however, the new classification would actually strengthen the category of active member. Prior to 1901 entrepreneurs could have been admitted as active members with full rights of voting and officeholding, if the clause concerning co-operation in "the advance of engineering knowledge or practice" was loosely interpreted. Creation of the new class of associate strengthened the professional standards in that sense. The discussion at the annual meeting of 1901 indicated that the Society's members felt they were relaxing membership requirements without jeopardizing the organization's status.

How strictly the clause "qualifying him to co-operate with engineers in the advance of engineering knowledge or practice" was applied is difficult to judge after seventy-five years. But the fact that it was introduced at the same time that the Society was admitting a large number of mining engineers, many of whom were members of the American Institute of Mining and Metallurgical Engineers, indicated a change in the Society's professional standards. The change apparently took place within the years between 1897 and 1901. Those years were also significant for the amendment of the organization's name to Montana Society of Engineers and the removal of the headquarters from Helena to Butte.

## CHAPTER 9

### "THOROUGHLY ABLE TO STAND ALONE:" THE YEARS AFTER 1899

In the years between 1887 and 1899 Montana developed from an isolated territory to the "Treasure State" producing a wealth of agricultural and mineral products. The Montana Society of Engineers felt that it had an active role in the state's progress. The organization was formed July 5, 1887 as the Montana Society of Civil Engineers. Forty-six engineers and surveyors met in Helena, Montana Territory, to create an association for the "advancement of the science of engineering and the interest of the profession."<sup>218</sup>

The engineers organized in response to the unique physical and technical problems presented by a new environment, problems which required the sharing of information and experience. They organized as a defense against unqualified and unscrupulous men who claimed to be engineers, thus damaging the reputation of competent professionals. They advertised the presence of qualified engineers within the Territory and discouraged the importation of engineers from eastern cities. They exercised a political influence on legislation dealing with matters of engineering and technology.

Traditionally, engineering societies were reluctant to involve themselves in politics, fearing that their elitist image would be marred by sordid association. This was less true of local societies,

and applied hardly at all to the Montana engineers. The Montana Society recognized its opportunity to shape legislation concerning engineering practices and to establish the precedent of a professional advisory board to guide and advise the legislature, state officials, and the general public. While they were careful to preserve appearances and to protect their status, members urged the Montana Society of Engineers' intervention in local, state, and federal affairs.<sup>219</sup>

During its first dozen years the Montana Society framed legislation on mineral location, town sites and plats, public land and mineral surveys, county road construction, water measurement, irrigation law, and the office of state engineer. The attempts met with varying degrees of success; some laws were amended beyond recognition, others passed only after repeated attempts. The Society was always careful, however, to maintain its professional standing. When legislative action appeared inexpedient, or was interpreted by the public as self-interest, the organization quickly abandoned it.

The paramount goals of the Montana Society of Civil Engineers between 1887 and 1899 were reputation and compensation. The association wished to appear as an advisory body above selfish interests and petty politics. The engineers complained that in spite of exacting standards of education and experience their occupation was ignored, distrusted, and underpaid. They coveted the status attained by the

legal and medical professions, which they felt would ensure respect, employment, and financial security.

In the early years the Montana Society was composed largely of civil engineers and surveyors, and its activities centered around topics of railroad location and construction, public land surveys, mineral surveys, and municipal planning. The profession like the Territory, was in a pioneering phase. In the early nineties irrigation enthusiasm swept the nation and the state. The Society was consulted as a fact-finding and advisory body, and several of its members became irrigation specialists.

By the second half of the decade railroad construction was declining, and many of the Society's early members left the state. Public land surveys also decreased, and surveyors sought employment with cities and counties. Others turned to construction of hydro-electric plants, or specialized in mining and metallurgy. The two were often linked, as new smelting and refining techniques required electric power. As the mineral industry consolidated it absorbed existing power companies or created new ones.

In 1897 the Montana Society acknowledged changes within the profession by amending its name to the Montana Society of Engineers. Civil engineers no longer controlled the organization; increasing specialization and the growth of the mineral industry invalidated the

original title. By 1899 the focus of the profession had shifted to Butte. The Society again adjusted, this time moving the headquarters to Butte.

The Montana Society of Civil Engineers had been essentially an organization of Helena men, primarily railroad engineers, public land surveyors, gold and silver mining experts, and later irrigation specialists. The name change, to Montana Society of Engineers, followed by transfer of the headquarters to Butte, signaled a new era in Montana's engineering profession. The Society's members had become specialists in electricity, geology, chemistry, irrigation, mining and metallurgy. Increasing technological sophistication encouraged stricter requirements for active membership, but industrialization led to relaxed standards for associate members.

In 1901 Frank L. Sizer was elected President of the Montana Society of Engineers. Sizer was a charter member of the Society, and in his acceptance speech he recalled its early years and looked optimistically to the future.

I have always taken great pride in this Society. While I have done much less than many others to build it up and strengthen it, I have yet tried to do my part in those years in the past, when, with our good President Haven--the only one who ever had the audacity to demand a "third term"--I assisted in putting hats on chairs to represent a quorum at some of our monthly meetings. But the Society has outgrown the age of tottling, and I feel it is thoroughly able to stand alone.

I am very much gratified with the growth of the Society. In four years we have just doubled our membership, and it seems to me that although our grand young treasure State has developed

wonderfully in this same period, our Society can say truly that it has more than justified the fondest hopes of its most sanguine members. It is certainly a gratification to know that in our membership is now contained nearly all of the most prominent members of the professions which are eligible to election in the Society throughout the State, and I feel that there is great need of still further push for the increase of our membership, and gathering in the younger men in the profession. The province of this Society is broad, the scope of it is large, and yet the work to be done is still larger; the opportunities for advancement of the members of this Society in every direction is very much greater than most of us realize. . . .220

In its first twelve years the Montana Society of Engineers set a precedent of active involvement in the affairs of the state. But in the four years to which Sizer referred, from 1897 to 1901, three significant changes occurred. The Montana Society changed its name, its location, and its membership qualifications. The era of the Montana Society of Civil Engineers had come to an end.

## FOOTNOTES

<sup>1</sup>Correspondence Walter W. deLacy to Fanny deLacy, November 14, 1877, deLacy Correspondence, Microfilm 158, Montana Historical Library, Helena. Fanny was a cousin with whom deLacy frequently corresponded.

<sup>2</sup>"In Memoriam. Walter Washington deLacy," Journal of the Association of Engineering Societies, XVIII (1897), 341-50. Parts of the Journal (hereafter referred to as AES J) relating to the Montana Society of Engineers can be found in Box 5, Montana Society of Engineers Collection, Montana State University Special Collections, Bozeman. James McClellan Hamilton, From Wilderness to Statehood: A History of Montana 1805-1900, ed. by Merrill G. Burlingame (Portland, Ore.: Binford & Mort, Publishers, 1957), 346-47, discussed Meredith's term of office.

<sup>3</sup>Hamilton, From Wilderness to Statehood, 354, said that Washburn retired in February 1871 because of failing health. Helen Fitzgerald Sanders, A History of Montana, 3 vols., (Chicago and New York: The Lewis Publishing Company, 1913), I, 664, stated that Washburn died January 26, 1871 from exposure suffered on an exploration of Yellowstone Park. Correspondence Walter W. deLacy to Fanny deLacy, December 21, 1873 and December 20, 1875, deLacy Correspondence, indicated that Blaine was guilty, although he was never prosecuted. DeLacy and the other deputies refused to testify against Blaine. For a complete list of Montana's Surveyors General to 1900, see Walter W. Johnson, "List of Officers of the Territory of Montana to 1876," Contributions to the Historical Society of Montana; Transactions, Act of Incorporation, Constitution, Ordinances, Officers, and Members (Vol. I) (Helena, Montana: Rocky Mountain Publishing Company, 1876), 328 and "List of Officers of the Territory of Montana," Contributions to the Historical Society of Montana; With Its Transactions, Officers and Members (Vol. III) (Helena, Montana: State Publishing Company, 1900), 359-60.

<sup>4</sup>Correspondence Walter W. deLacy to Fanny deLacy, December 20, 1875, deLacy Correspondence.

<sup>5</sup>Correspondence Walter W. deLacy to Fanny deLacy, July 17, 1878, and November 14, 1877, deLacy Correspondence.

<sup>6</sup>Correspondence Walter W. deLacy to Martin Maginnis, January 17, 1883, Sizer Collection, Letterpress, Unprocessed. Montana Historical Library Archives, Helena.

<sup>7</sup>Rollin I Reeves, quoted in William R. Bandy, "The Survey of the North Boundary of Wyoming: A Study of the Field Notes of the Original Survey and an Account of Recent Retracements," Box 3, File M. S. E. Historical 1880's, Montana Society of Engineers Collection, 3-5. (Hereafter referred to as M. S. E. Collection.) When Bandy resurveyed the boundary he said, "Although errors in alinement [sic] and measurement have been found, the survey as a whole was well executed, taking into consideration the adverse conditions under which it was made."(3)

<sup>8</sup>Letter Addressed to the Hon. Thomas H. Carter, Member of Congress from Montana, on the Reform of the Public Land Surveys, by the Montana Society of Civil Engineers, Helena, Montana, (Helena: Williams, Thurber & Co., Printers and Binders, 1890), 3-5. The Montana State University Special Collections contains a copy of the Letter. Correspondence deLacy to Maginnis, January 17, 1883, Sizer letterpress.

<sup>9</sup>Walter W. deLacy quoted by Roswell H. Mason, "Report of the Surveyor General of Montana," Annual Report of the Secretary of the Interior of the Operations of the Department for the Fiscal Year ended June 30, 1878 (Washington: Government Printing Office, 1878), 297. The Stinking Water was renamed the Ruby Valley.

<sup>10</sup>Mason, "Report of the Surveyor General," Report of the Secretary of the Interior (1878), 297.

<sup>11</sup>Letter Addressed to the Hon. Thomas H. Carter, 5, 7-8.

<sup>12</sup>U. S. Statutes at Large, XVII (March 1871-March 1873), ch. 415, p. 357; ch. 227, 515-16. XVIII, pt. 3 (December 1873-March 1875), ch. 455, p. 212; ch. 130, p. 383. XIX (December 1875-March 1877), ch. 246, pp. 120-21; ch. 105, p. 348. XXI (April 1879-March 1881), ch. 235, p. 273. Mason, "Report of the Surveyor General," Report of the Secretary of the Interior (1878), 298.

<sup>13</sup>U. S. Statutes at Large, XXII (December 1881-March 1883), ch. 433, p. 327. deLacy to Maginnis, January 17, 1883, Sizer letterpress.

<sup>14</sup>William A. J. Sparks, "Report of the Commissioner of the General Land Office," Report of the Secretary of the Interior for the Fiscal Year Ending June 30, 1885. 5 vols. (Washington: Government Printing Office, 1885) I, 313. Correspondence Frank L. Sizer to Ed [Sizer], June 13, 1882, Sizer Collection, Letterpress.

<sup>15</sup>Correspondence Frank L. Sizer to R. W. Burns, June 4, 1882; Correspondence Frank L. Sizer to Ed [Sizer], June 13, 1882, Sizer letterpress.

<sup>16</sup>Correspondence Sizer to E. J. Hall, June 13, 1882; Concerning his salary, Frank L. Sizer to Ed [Sizer], March 31, 1882, Sizer letterpress.

<sup>17</sup>Correspondence Sizer to "Doc" [Albert W. Hard], April 25, 1882. On Cunningham, Frank L. Sizer to Ed [Sizer], June 13, 1882, Sizer letterpress.

<sup>18</sup>Sparks, "Report of the Commissioner," Report of the Secretary of the Interior (1885) I, 163.

<sup>19</sup>"In Memoriam. Walter Washington deLacy," AES J, XVIII (1897), 341-50. "In Memoriam. Benjamin H. Greene, Died January 4, 1897," AES J, X (1891), 105-13.

<sup>20</sup>Correspondence Walter W. deLacy to Fanny deLacy, March 9, 1886, deLacy Correspondence.

<sup>21</sup>J. J. Donovan, "1887-1916," Quarterly Journal of the Montana Society of Engineers I (January 1916), 37. W. A. Haven, "A Confession," Quarterly Journal I (January 1916), 48. (The Quarterly Journal may be found in Box 4, M. S. E. Collection.) E. H. McHenry, "The Story of the Homestake Pass," Box 3, File Minutes of Annual Meetings 1915-25, M. S. E. Collection, 11.

<sup>22</sup>George F. Brimlow, ed. "Marias Pass Explorer John F. Stevens," Montana Magazine of History III (Summer 1953), 43. On economy of the Great Northern Line, 44.

<sup>23</sup>Haven, "A Confession," 48. A twenty-degree curvature means that an arc of one hundred feet subtends a twenty-degree central angle.

<sup>24</sup>McHenry, "The Story of the Homestake Pass," M. S. E. Collection, 8-9. McHenry went on to become chief engineer of the Northern Pacific Railway, and was appointed as a receiver for the NP in 1893.

<sup>25</sup>Montana, Seventh Report of the Bureau of Agriculture Labor and Industry of the State of Montana for the Year Ending November 30, 1900 (Helena: Independent Publishing Company, 1900), 47. For discussion of Montana mining technology, manuscript from a forthcoming book by Michael P. Malone and Richard B. Roeder.

<sup>26</sup>"Sewerage," The Helena Independent, June 11, 1886. The article did not specify whether the "committee" is the engineering commission or the city council. "Water and Sewerage," Independent, June 20, 1886, commented on Greene, deLacy, and Dodge as members of the committee. Correspondence Walter W. deLacy to Fanny deLacy, June 30, 1886, deLacy Correspondence.

<sup>27</sup>Haven, "A Confession," Quarterly Journal, 49.

<sup>28</sup>Ralph S. Bates, Scientific Societies in the United States (New York: John Wiley & Sons, Inc., 1945), 121 showed at least twenty professional groups formed in the decade from 1880-1889.

<sup>29</sup>[Minutes], March 22, 1887, Box 3, File M. S. E. Historical 1880's, M. S. E. Collection. For a discussion of the term "civil engineer" see Daniel Hovey Calhoun, The American Civil Engineer: Origin and Conflict (Cambridge: Harvard University Press, 1960), ix-xi. Biographical information on the Society's members was drawn from newspaper accounts, correspondence, membership applications, minutes, and publications of the Montana Society, and from the "mug histories:" M. A. Leeson, History of Montana. 1739-1885. (Chicago: Warner, Beers & Company, 1885.); Joaquin Miller, An Illustrated History of the State of Montana (Chicago: The Lewis Publishing Co., 1894); Progressive Men of the State of Montana. (Chicago: A. W. Bowen & Co., Engravers and Publishers, circa 1900); Tom Stout, ed. Montana: Its Story and Biography (Chicago and New York: The American Historical Society, 1921); Sanders A History of Montana. Biographical information is incomplete and the men often changed occupations, so I tried to give their specific employment in 1887. The tabulated figures cover a wider time period, and illustrate the vocational mobility of the profession.

<sup>30</sup>"The Civil Engineers to Organize," Independent, May 10, 1887.

<sup>31</sup>"Ecstatic Engineer," Independent, January 22, 1888, 8.

<sup>32</sup>Robert George Raymer, Montana, the Land and the People, 3 vols. (Chicago: The Lewis Publishing Company, 1930, I, 449. Montana. First Annual Report of the Bureau of Agriculture, Labor, & Industry of Montana for the Year Ended November 30, 1893 (Helena: State Publishing Co., 1893), 287, 293.

<sup>33</sup>Montana. First Annual Report of the Bureau of Agriculture, Labor & Industry (1893), 272, 276 on livestock, 196 for school enrollments, 231 on city population, Montana: Its Climate, Industries, and Resources (Helena: Geo. E. Boos & Co., c. 1884), 16 on schools.

<sup>34</sup>[Minutes], March 22, 1887, M. S. E. Collection. "Meeting of Civil Engineers," Independent, July 6, 1887, 4 reports forty-six members. F. L. Sizer and G. E. Ingersoll were elected retroactively to charter membership ([Minutes], January 19, 1888, Box 3, File M. S. E. Historical 1880's, M. S. E. Coll; "Proceedings," AES J, VIII (1889), 56). W. A. Haven, recuperating at Cape Ann, Mass. from a fire, wrote to James Keerl asking to be enrolled as a charter member (Haven, "A Confession," Quarterly Journal I (January 1916), 48).

<sup>35</sup>"Proceedings," AES J, IX (1890), 258. James Keerl quoted from the constitution. Unfortunately, the original constitution was not in the collection. From scattered references, such as Keerl's quote, a few of the initial concerns can be reconstructed.

<sup>36</sup>"Reportorial Notes," Independent, August 21, 1887, 5.

<sup>37</sup>Independent, August 23, 1887, 4; "Special Meeting," Independent, August 24, 1887, 5.

<sup>38</sup>"Col. Dodge's Vacation," Independent, October 28, 1887, 2.

<sup>39</sup>"Ecstatic Engineers," Independent, January 22, 1888, 8. Mayonaise was spelled with only one "n" in the original menu.

<sup>40</sup>Ibid.

<sup>41</sup>"Banquet Oratory," Independent, January 24, 1888, 3.

<sup>42</sup>Ibid.

<sup>43</sup>"Rivers and Harbors," Independent, May 2, 1888, 3. Joseph K. Toole acknowledged receipt of the memorial and assured the Society of his support. ("Proceedings," AES J, VII (1888), 386.

<sup>44</sup>"Proceedings," AES J VII (1888), 386, 427. "Civil Engineers Meet," Independent, October 23, 1888, 4. The Western Society of Engineers was also a member of the Association of Engineering Societies.

<sup>45</sup>"Proceedings," AES J VII (1888), 427.

<sup>46</sup>"Regular Monthly Meeting," Independent, May 22, 1888, 4; "Civil Engineers," Independent, July 22, 1888, 4; "Engineers Meeting," Independent, April 29, 1888, 5, mention topics of discussion at the meetings.

- 47 "Proceedings," AES J, VIII (1889), 239-43.
- 48 Ibid., 243, 249.
- 49 Ibid., 249.
- 50 Ibid., 246.
- 51 Montana, House Journal of the Sixteenth Session of the Legislative Assembly of the Territory of Montana (1889), 124. "Proceedings," AES J, VIII (1889) 246-49 gives the text of H. B. 34.
- 52 "The Legislature," Independent, March 7, 1889, 4. Montana, House Journal of the Sixteenth Session (1889), 208, 218. The bills passed March 8.
- 53 Montana, Council Journal of the Sixteenth Session of the Legislative Assembly of the Territory of Montana, (1889), 270, 288, 293. "The Legislature," Independent March 14, 1889, 4.
- 54 "Mining Locations," Independent, March 8, 1889, 2; Editorial, Independent, March 14, 1889, 2.
- 55 Montana, Council Journal of the Sixteenth Session (1889), 149-50, 238-39, 275.
- 56 Montana, House Journal of the Sixteenth Session (1889), 251, 269. Montana, Council Journal of the Sixteenth Session (1889), 304, 315.
- 57 "Proceedings," AES J, IX (1890), 70. "An Interesting Meeting," Independent, May 19, 1889, 4. For discussion of boiler inspection and licensing see "Proceedings," AES J, VIII (1889), 363-64.
- 58 "Proceedings," AES J, VIII (1889), 417.
- 59 "Report on Irrigation in Montana," Box 3, File M. S. E. Historical 1880's M. S. E. Collection, 4. Correspondence Walter W. deLacy to Fanny deLacy, August 30, 1889, deLacy correspondence, complained that the rest of the committee would not help. "Irrigation Questionnaire from W. W. deLacy and G. O. Foss, 1889," Series 5, The Fort Belknap Indian Agency General Records, 1878-1952, Federal Record Center, Seattle, Washington. A copy of the questionnaire may be found in Box 3, File M. S. E. Historical 1880's, M. S. E. Collection.

<sup>60</sup>"Our Arid Lands," Independent, August 10, 1889, 1. Proceedings and Debates of the Constitutional Convention Held in the City of Helena, Montana July 4th, 1889, August 17th, 1889 (Helena: State Publishing Company, 1921), 803-05.

<sup>61</sup>"Proceedings," AES J, VIII (1889), 475-76. Proceedings and Debates of the Constitutional Convention, 418 gives slightly different punctuation. The disaster referred to is the Johnstown flood.

<sup>62</sup>Proceedings and Debates of the Constitutional Convention, 488.

<sup>63</sup>"Proceedings," AES J, IX (1890), 71.

<sup>64</sup>U. S. Statutes at Large, XXIV (December 1885-March 1887), ch. 902, p. 240; ch. 362, p. 527.

<sup>65</sup>William A. J. Sparks, "Report of the Commissioner of the General Land Office," Report of the Secretary of the Interior for the Fiscal Year Ending June 30, 1887 5 vols. (Washington: Government Printing Office, 1887), I, 317.

<sup>66</sup>U. S., Statutes at Large, XXIII (December 1883-March 1885), ch. 360, 499. XXIV, ch. 902, p. 240; ch. 362, p. 527; XXV (December 1887-March 1889), ch. 1069, p. 525; ch. 411, p. 959.

<sup>67</sup>"Civil Engineers," Independent, February 17, 1889, 4. For a general history of military surveys, see William H. Goetzmann, Army Explorations in the American West 1803-1963, (New Haven: Yale University Press, 1959) and A. Hunter Dupree, Science in the Federal Government (Cambridge: Belknap Press of Harvard University Press, 1957), Chapters 5 and 10.

<sup>68</sup>Letter Addressed to the Hon. Thomas H. Carter, 9-13.

<sup>69</sup>George O. Eaton, "Report of the Surveyor General of Montana," Annual Report of the Secretary of the Interior for the Fiscal Year Ending June 30, 1890, 5 vols. (Washington: Government Printing Office, 1890) I, 424.

<sup>70</sup>George O. Eaton, "Report of the Surveyor General of Montana," Annual Report of the Secretary of the Interior for the Fiscal Year Ending June 30, 1891, 5 vols. (Washington: Government Printing Office, 1891) I, 369.

<sup>71</sup>U. S. Statutes at Large, XXVI (December 1889-March 1891), ch. 542, p. 971. XXVII (December 1891-March 1893), ch. 380, p. 369.

<sup>72</sup>Correspondence T. C. Power to J. S. Keerl, December 12, 1891, Box 1 File S. B. 663 1891-92, M. S. E. Collection. "Proceedings," AES J XI (1892), 37. "Report of Com. Senator Powers Senate Bill #663. Read and adopted Jan. 9, 1892," Box 1, File S. B. 663 1891-92, M. S. E. Collection.

<sup>73</sup>"Proceedings," AES J, XI (1892), 216. "Report of Committee upon Senator Powers bill regarding Public Surveys," (April 9, 1892), Box 1, File S. B. 663 1891-92, M. S. E. Collection, 4.

<sup>74</sup>Correspondence T. H. Carter to F. D. Jones, April 25, 1892, Box 1, File Correspondence 1892, M. S. E. Collection. U. S. Congress, Congressional Record, 52d Cong., 1st Sess., XXIII, 41. U. S., Statutes at Large, XXVII, ch. 380, p. 369-70.

<sup>75</sup>"Proceedings," AES J, XI (1892) 38, 116-17; IX (1890), 202, 375, 548. "The Civil Engineers," Independent, February 16, 1890, 8.

<sup>76</sup>American Society of Civil Engineers, Proceedings of the American Society of Civil Engineers, XVI (1890), 139-57; XVII (1891), 144. "Proceedings," AES J, VIII (1889), 579-82; IX (1890), 69, 375, 377.

<sup>77</sup>Western Society of Engineers, "Report of Committee on International Engineering Congress," (June 18, 1890), Box 1, File Correspondence 1890, M. S. E. Collection.

<sup>78</sup>Correspondence F. A. Ross to F. D. Jones, May 10, 1892, Box 1, File Columbian Expo 1891-1892, M. S. E. Collection.

<sup>79</sup>Correspondence American Society of Civil Engineers to J. S. Keerl, n. d., Box 1, File Columbian Expo. 1891-1892, M. S. E. Collection.

<sup>80</sup>"The Montana Engineers," Independent, January 15, 1890, 5. "Proceedings," AES J, IX (1890), 68, 70.

<sup>81</sup>"Proceedings," AES J, X (1891), 152-55.

<sup>82</sup>Ibid., XI (1892), 115-17.

<sup>83</sup>Ibid., IX (1890), 69, 71; X (1891), 154; XI (1892), 115-16. [Secretary's Report], January 14, 1893, Box 3, File Minutes of Annual Meetings, 1891-1899, M. S. E. Collection.

<sup>84</sup>Haven, "A Confession," Quarterly Journal, 49-50.

<sup>85</sup>"Proceedings," AES J, IX (1890), 258.

<sup>86</sup>Ibid.

<sup>87</sup>Ibid., IX (1890), 375, 376.

<sup>88</sup>Ibid., X (1891), 377, 605.

<sup>89</sup>Montana Society of Civil Engineers, Constitution and By-Laws. August 1891. Art. I, Sec. 3. Montana Historical Society Library.

<sup>90</sup>Ibid., Art. 5, Sec. 1, 4, 5.

<sup>91</sup>"Report of a Committee upon the establishment of the office of State Engineer 1891," (February 21, 1891), Box 1, File Correspondence 1891, M. S. E. Collection.

<sup>92</sup>E. H. Wilson, "Some Trials and Responsibilities of the Engineer," AES J, XI (1892), 100.

<sup>93</sup>Correspondence J. S. Keerl to W. A. Haven, December 28, 1892, Box 1, File Correspondence 1892, M. S. E. Collection. "Proceedings," AES J, XII (1893), 106. Donald Bradford joined the Society April 10, 1897 ("Proceedings," AES J, XVIII (1897), 53).

<sup>94</sup>"Proceedings," AES J, XII (1893), 108. [Minutes], January 14, 1893, Box 3, File Minutes of Annual Meetings, 1891-1899, M. S. E. Collection, 4.

<sup>95</sup>"Do Not Favor the Bill," Independent, January 15, 1893, 2. [Minutes], January 14, 1893, M. S. E. Collection, 5. For a description of the Colorado and Wyoming systems, see Robert G. Dunbar, "The Search for a Stable Water Right in Montana," Agricultural History, XXVIII (October 1954), 138-49.

<sup>96</sup>[Minutes], January 14, 1893, M. S. E. Collection, 6-7.

97 "A Bill for 'An Act' To Establish Departments and to Create a State Water Commission and to Define the Powers of Each," Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection, Sec. 7. [Minutes], January 14, 1893, M. S. E. Collection, 8.

98 [Minutes], January 14, 1893, M. S. E. Collection, 8. Anti-corporate feeling was high at this time, probably because of the Northern Pacific land grants, the decline of silver, and the beginnings of the Populist movement. All discussion on Huffman's bill was taken from the Minutes of January 14, 1893 and from "Do Not Favor the Bill," Independent, January 15, 1893, 2.

99 [Minutes], January 14, 1893, M. S. E. Collection, 9, 12-13.

100 "The Water Commission," Independent, January 25, 1893, 2.

101 "Answer to B. F. Shuart," Independent, January 31, 1893, 4. "Waters of the State," Independent, February 1, 1893, 2.

102 "Reply to Mr. Kennedy," Independent, February 9, 1893, 2.

103 "Is Not Smooth Sailing," Independent, February 10, 1893.

104 "The Convention Says No," Independent, February 11, 1893, 5. Montana, House Journal of the Third Session of the Legislative Assembly of the State of Montana. (1893), 222.

105 "Montana's Opportunity," Independent, January 17, 1893, 4.

106 Correspondence, F. L. Sizer to F. H. Newell, July 3, 1893, Sizer letterpress. Correspondence Henry B. Davis to G. O. Foss, January 7, 1893, Box 3, File Minutes of Annual Meetings, 1891-1899, M. S. E. Collection. This letter is filed with the Minutes of 1894, since it was apparently misdated. The Minutes correspond to those reported in the AES J for 1894. Also, the letter wishes a happy 1894. Reeder's questions, which Davis answers, were sent out in November 1893. McFarlane's comment was discussed in "Proceedings," AES J, XIII (1894), 114.

107 "Proceedings," AES J, XIV (1895), 82, 87-88; XV (1895), 21. Correspondence Montana Society of Engineers to J. S. Keerl, January 2, 1895; Correspondence W. A. Haven to J. S. Keerl, June 8, 1895; Correspondence Charles J. Roney to Forrest J. Smith, June 18, 1895, Box 1, File Correspondence 1895, M. S. E. Collection.

108 Correspondence W. A. Haven to Mr. Goodale, January 18, 1902, Box 1, File Correspondence 1902, M. S. E. Collection.

109 A. M. Ryon, "Engineering Education in Montana," AES J, XII (1893), 185-89.

110 E. R. McNeill, "Lining of Boulder (Wickes) Tunnel," AES J, XII (1893), 331-50.

111 Fred P. Gutelius, "Construction of the Wooden Pipe Line for Butte City Water-Works," AES J, XII (1893), 209-20.

112 E. H. Beckler, "Reconnaissance and Location of the Pacific Extension of the Great Northern Railway," AES J, XII (1893), 385-92. H. C. Relf, "Masonry Lining at Mullen Tunnel," AES J, XIII (1894), 432-38. Elbridge H. Beckler, "The United Verde and Pacific Railway," AES J, XIV (1895), 131-47.

113 "Proceedings," AES J, XII (1893), 476.

114 E. H. Beckler, "To The Montana Society of Civil Engineers," (October 4, 1893), Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection.

115 Charles Tappan, "Irrigation from the Yellowstone River," AES J, XIII (1894), 69. A. E. Cumming, "The West Gallatin Irrigation Canal, Montana," AES J, XIII (1894), 405-12.

116 [Minutes], January 13, 1894, Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection, 6.

117 Ibid., 10.

118 Ibid., 6ff.

119 A. M. Ryon, "Measurement of Water," AES J, XIV (1895), 85.

120 "They Must Be Read," Independent, January 19, 1895, 5. "King Caucus Rules," Independent, February 1, 1895, 5. "Passed the Senate," Independent, February 3, 1895, 8. "All the Same Way," Independent, February 8, 1895, 5. "Proceedings," AES J, XIV (1895), 38. "It Will Be Close," Independent, February 16, 1895, 5.

- 121, "To Measure Water," Independent, February 14, 1895, 2.  
 "Measuring Water," Independent, February 17, 1895, 6. "Pomeroy  
 Defeated," Independent, February 17, 1895, 8. "All Fled But One,"  
Independent, February 22, 1895, 5. "Is Moving Rapidly," Independent,  
 March 1, 1895, 6.
- 122 "Proceedings," AES J, XIII (1894), 115-16; XIV (1895), 12-13.  
 [Minutes], January 12, 1895, Box 3, File Minutes of Annual Meetings  
 1891-1899, M. S. E. Collection, 13-14. Correspondence E. R. McNeill to  
 W. A. Haven, December 8, 1894, Box 1, File Correspondence 1894, M. S. E.  
 Collection.
- 123 "Good Roads Laws," Independent, January 31, 1895, 6.
- 124 "Good County Roads," Independent, February 7, 1895, 3.
- 125 [Minutes], January 14, 1895, Box 3, File Minutes of Annual  
 Meetings 1891-1899, M. S. E. Collection, 16.
- 126 "All Done By Hand," Independent, January 31, 1895, 5. "King  
 Caucus Rules," Independent, February 1, 1895, 5. "Montana Road Laws,"  
Independent, March 4, 1895, 5. Montana, Codes and Statutes, (1895)  
 Political Code, Sec. 2600-2849, Sec. 4470-4478.
- 127 "Proceedings," AES J, XIV (1895), 65, 67-68.
- 128 "Proceedings," AES J, XIII (1894), 15; XIV (1895), 65.  
 Correspondence Commissioner of the General Land Office to W. A. Haven,  
 January 27, 1894, Box 1, File Correspondence 1894, M. S. E. Collection.
- 129 Annual Report of the Secretary of the Interior for the  
 Fiscal Year Ending June 30, 1894 5 vols. (Washington: General Printing  
 Office, (1894), I, xvi-xvii, 103-07. Congressional Record, 53d Cong.,  
 3d Sess., XXVII, 961.
- 130 Correspondence F. L. Sizer to H. B. Davis, January 2, 1895;  
 Correspondence Sizer to Charles Tappan, January 2, 1895; Sizer to A.  
 B. Knight, January 3, 1895; Sizer to Emma Sizer, January 17, 1895,  
 Sizer letterpress.
- 131 "It Was All Spent," Independent, February 14, 1895, 5.
- 132 "Proceedings," AES J, XIII (1894), 13.

133 Montana, Laws, Resolutions and Memorials (1897), House Bill No. 266. "Proceedings," AES J, XVIII (1897), 45-48. "They Joined Hands," Independent, February 25, 1897.

134 Montana, Laws, Resolutions and Memorials (1897), House Bill 280.

135 "Proceedings," AES J, XVIII (1897), 49. "Meeting of Surveyors," Independent, March 29, 1897. "To Organize To-Day," Independent, March 30, 1897.

136 "Proceedings," AES J, XIX (1897), 9. "Good Roads Society," Independent, March 31, 1897, 5.

137 [Minutes] January 14, 1893, Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection, 12. "Proceedings," AES J, XII (1893), 169.

138 "Proceedings," AES J, XIX (1897), 9-15.

139 M. S. Parker, "The New Road Law of Montana," AES J, XIX (1897), 102.

140 "Proceedings," AES J, XIX (1897), 9-15.

141 Ibid., 14. "To Organize To-Day," Independent, March 30, 1897.

142 "Proceedings," AES J, XIX (1897), 15.

143 Ibid., 4. Proceedings of the Eleventh Annual Meeting of the Montana Society of Engineers (1898), Box 4, M. S. E. Collection, 7. Correspondence F. L. Sizer to F. W. Blackford, October 15, 1898, Sizer letterpress.

144 "Get Down to Work," Independent, January 5, 1899, 5. "Specimen Road Law," Independent, January 14, 1899, 8. "Another Road Law," Independent, February 3, 1899, 2.

145 "It Went a Kiting," Independent, February 22, 1899, 5. "Had a Close Shave," Independent, February 23, 1899, 5. "It Legalizes Glove Contests," Independent, February 24, 1899, 5.

146 Montana, Laws, Resolutions and Memorials (1899), Sub. for House Bill No. 5, House Substitute for Senate Bill No. 38. "Where the Bills Are," Independent, March 2, 1899.

147 "Road Law Non Est," Independent, March 9, 1899, 5. This explanation differs from the opinion Penwell ascribed to Nolan in March 1897. Either Penwell misinterpreted Nolan or Nolan had since altered his opinion on the 1897 road law.

148 State ex rel. Donyes v. Board of County Commissioners of Granite County, 23 Montana Reports 250 (1900). This distinction, per diem versus salary, established the constitutionality of the 1897 law.

149 Francis W. Blackford, "The Development of Roads and Street Pavements," Montana Society of Engineers. Synopsis of Proceedings of Meetings During the Year 1899 (1900), Box 4, M. S. E. Collection, 15. In the second decade of the twentieth century the Montana Society was active in the national Good Roads movement.

150 "Proceedings," AES J, XVIII (1897), 62. Charles Tappan, "Surveying Mining Claims," AES J, XIX (1897), 33-37.

151 John Herron quoted in discussion of Tappan, "Surveying Mining Claims," 36.

152 For examples of mechanical mining techniques, see Fred D. Smith, "The Bear Gulch Placers, Montana," Engineering and Mining Journal (December 23, 1897), 757. Hereafter referred to as EMJ. Fred D. Smith, "A Low-Grade Placer Proposition in Montana," EMJ, (November 11, 1899), 575-76. Walter Harvey Weed, "Mineral Resources of the Judith Mountains, Montana," EMJ (May 23, 1896), 496-98. Eugene B. Braden, "Gold Dredging in Montana," EMJ (November 20, 1897), 605-08. "Placer Mining Dredges on Grasshopper Creek, Montana," Engineering News, (October 14, 1897), 244-45. Eugene Carroll, "Address Before the Thirteenth Annual Meeting," Synopsis of Proceedings (1900), M. S. E. Collection, 24-31.

153 "Geology of Helena," Independent, June 27, 1897, 5. L. S. Griswold, "The Geology of Helena, Montana, and Vicinity," AES J, XV (1898), 51-68. On renewed activity in placer mining, see "Montana Mines in 1897," EMJ January 8, 1893, 43-44.

154 "Proceedings," AES J, XIX (1897), 3; XX (1898), 74. "Address of Walter Harvey Weed," Independent, June 12, 1898, 5.

155 For discussion of extralateral rights and the litigation at Butte, see Clark C. Spence, Mining Engineers & The American West: The Lace-Boot Brigade, 1849-1933 (New Haven and London: Yale University Press, 1970), 195-230. C. B. Glasscock, The War of the Copper Kings: Builders of Butte and Wolves of Wall Street (New York: Grosset & Dunlap 1935) 166ff. Joseph Kinsey Howard, Montana: High Wide and Handsome (New Haven: Yale University Press, 1943), 66ff. K. Ross Toole, Montana: An Uncommon Land (Norman: University of Oklahoma Press, 1959), 186ff. Information on the Drumlummon litigation from the manuscript of a forthcoming book by Michael P. Malone and Richard B. Roeder.

156 Spence, Mining Engineers, 195-230. "The Proposed Revision of the Mining Laws," EMJ (December 4, 1897), 666-68. [R. W. Raymond], "The Proposed Revision of the United States Mining Law," EMJ (October 30, 1897) 512. [R. W. Raymond], "The Proposed Revision of the United States Mining Law," EMJ (December 11, 1897), 692-93.

157 "Proceedings," AES J, XXII (1899), 35.

158 J. S. Keerl, "The Standing of Engineering Among the Professions," AES J, XVI (1896), 72.

159 M. S. Parker, "Engineering Compensation," AES J, XVIII (1897), 102.

160 "Proceedings," AES J, XVIII (1897), 6. Keerl, "The Standing of Engineering" 73-74. [Minutes], January 9, 1897, Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection, 4-5.

161 M. S. Parker, "Cost of Steam and Water Power in Montana," AES J, XV (1895), 26-27. "Proceedings," AES J, XIV (1895), 68.

162 Correspondence W. C. Sterling to Montana Society of Civil Engineers, n. d.; W. W. Reed, "Relating to Cost of Power from a Missouri River Dam," Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection. Both papers are filed with the Minutes of 1896.

163 "Involves a Million," Independent, February 5, 1897, 8.

164 "Must Be Truthful," Independent, February 5, 1897, 8.

165 "Work on the Dam," Independent, February 15, 1897, 8. Incidentally, Cooper was never a member of the Society.

- 166 "Supervision of Reservoir," Independent, March 3, 1897, 4.
- 167 M. S. Parker quoted in discussion of a paper by Theron M. Ripley, "The Canyon Ferry Dam," Eleventh Annual Meeting (1898), M. S. E. Collection, 17.
- 168 M. S. Parker, "Partial Failure of the Timber Crib Dam of the Montana Power Company Near Butte, Montana," Proceedings of the Twelfth Annual Meeting of the Montana Society of Engineers (1899), Box 4, M. S. E. Collection, 24-44.
- 169 Ibid., 34.
- 170 Ibid., 41-42.
- 171 Jos. H. Harper, "The Reconstruction of the Big Hole Dam," Synopsis of Proceedings (1900), M. S. E. Collection, 41-56.
- 172 Ripley, "The Canyon Ferry Dam," M. S. E. Collection, 9-18. Twelfth Annual Meeting (1899), M. S. E. Collection, 5. "The Reconstructed Canyon Ferry Dam, Near Helena, Mont.," Engineering News, (April 26, 1900), 266.
- 173 J. T. Fanning, quoted in "The Reconstructed Canyon Ferry Dam," 266.
- 174 Eugene Carroll, "The Construction of a Crib Dam for the Butte City Water Co." Twelfth Annual Meeting (1899), M. S. E. Collection, 53.
- 175 "Telephone System With Dams," Independent, February 11, 1899, 4.
- 176 "Danger Signals With Dams," Independent, February 14, 1899, 4.
- 177 For discussion on the need for a state engineer, see Parker, "Partial Failure of the Timber Crib Dam," 42; Ripley, "The Canyon Ferry Dam," 17-18; Eleventh Annual Meeting (1898), M. S. E. Collection, 5-7.
- 178 Ibid.
- 179 Correspondence F. L. Sizer to Elwood Mead, November 13, 1898, Sizer letterpress.

180 "Proceedings," AES J, XXII (1899), 17. Twelfth Annual Meeting (1899), 1-2.

181 Twelfth Annual Meeting (1899), 3-5.

182 "Favored Mr. Wilson's Bills," Independent, January 21, 1899, 7. "Another Soft Job," Independent, January 27, 1899, 8. For information on the Clark-Daly feud, see Glasscock, Copper Kings, 166ff; Howard, Montana: High, Wide, and Handsome, 66ff; Toole, Montana: An Uncommon Land, 186ff.

183 "Is It a Coincidence," Independent, January 25, 1899, 8.

184 "Its Friends in Evidence," Independent, February 18, 1899, 6. "Favor Cubic Feet Standard," Independent, February 23, 1899, 8. "In Gov. Smith's Hands," The Butte Miner, February 23, 1899, 4. Editorial, Independent, February 25, 1899, 4. "The Water Bill," Independent, February 24, 1899, 4. Montana, Laws, Resolutions and Memorials (1903), Ch. CXIV, Sec. 6.

185 "Another Soft Job," Independent, January 27, 1899, 8.

186 Montana, Senate Journal of the Sixth Session of the Legislative Assembly of the State of Montana (1899), 252, 255. "It Went a Kiting," Independent, February 22, 1899, 5.

187 Stanley R. Davidson, "Hopes and Fancies of the Early Reclamationists," in Montana's Past: Selected Essays, ed. Michael P. Malone and Richard B. Roeder (University of Montana Publications in History, 1973), 317-34. William E. Smythe, The Conquest of Arid America (Seattle: University of Washington Press, 1905. Roy E. Huffman, Irrigation Development and Public Water Policy (New York: The Ronald Press Company, 1953).

188 C. W. Goodale; "Address Before the Montana Society of Engineers," Eleventh Annual Meeting (1898), Box 4, M. S. E. Collection, 25-26.

189 "Wealth in Rivers," Independent, September 21, 1898, 5.

190 Twelfth Annual Meeting (1899), M. S. E. Collection, 2.

191 Correspondence W. A. Haven to Goodale, January 18, 1902, Box 1, File Correspondence 1902; [Secretary's Report], January 14, 1893, Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection. "Proceedings," AES J, XIII (1894), 13-14. [Minutes], January 12, 1901, Box 3, File Minutes of Annual Meetings 1900-1914, M. S. E. Collection, 7. Frank L. Sizer, "Recollections," Quarterly Journal I (January 1916), 39.

192 Correspondence Eugene Carroll to F. L. Fisher, December 26, 1927, Box 1, File 1827, M. S. E. Collection. Carroll's letter apparently referred to the meeting of October 14, 1894, mentioned in "Proceedings," AES J, XIII (1894), 100. At that time Haven was President of the Society, Keerl was elected the following January. Carroll also placed the meeting in 1892 and referred to it as the annual meeting. These are minor discrepancies, though, and the incident was remarkable enough that Carroll's memory was probably accurate on the major details.

193 Monte A. Calvert, The Mechanical Engineer in America 1830-1910: Professional Cultures in Conflict (Baltimore: The Johns Hopkins Press, 1967), 203 ff. Edwin T. Layton, Jr., The Revolt of the Engineers: Social Responsibility and the American Engineering Profession (Cleveland and London: The Press of Case Western Reserve University, 1971), 33ff.

194 Correspondence John C. Trautwine to A. S. Hovey, September 23, 1897, (filed with Secretary's Report for 1898); [Secretary's Report], January 13, 1894; [Secretary's Report], January 11, 1896; Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection. "Proceedings," AES J, XIV (1895), 7-8. "Address by James M. Page, Retiring President, Before Montana Society of Engineers, at Its 12th Annual Meeting, in Helena, Montana, on January 14, 1899," Twelfth Annual Meeting (1899), 18.

195 "Proceedings," AES J, XIV (1895), 8.

196 John Herron, "Address Before the Montana Society of Civil Engineers," AES J, XVIII (1897), 146; "Proceedings," AES J, XVIII (1897), 5-7.

197 "Past Officers," Latest List of the Officers and Members Constitution and By-Laws of the Montana Society of Engineers (1910), Box 1, File Membership Lists, M. S. E. Collection, 13-19.

198 Herron, "Address," AES J, XVIII (1897), 147.

199 "Proceedings," AES J, VII (1889), 243, 249. Correspondence A. S. Hovey to Frank Scotten, August 31, 1932, Box 1, File 1932; [Minutes], January 9, 1897, Box 3, File Minutes of Annual Meetings 1891-1899, M. S. E. Collection, 6. "Proceedings," AES J, XVIII (1897), 18.

200 Herron, "Address," 147.

201 [Minutes], January 9, 1897, Box 3, File Minutes of Annual Meetings 1891-1899, 3.

202 "Proceedings," AES J, XV (1898), 25. Eleventh Annual Meeting (1898), 3-4.

203 Twelfth Annual Meeting (1899), 6-8.

204 Twelfth Annual Meeting (1899), 8. "Proceedings," AES J, XXII (1899), 34, 69, 86, 89, XXIII (1899), 2, 9.

205 Merrill G. Burlingame, "The Mining Frontier in Montana" in Montana's Past, ed. Malone and Roeder, 82-117. Seventh Report of the Bureau of Agriculture Labor and Industry of the State of Montana for the Year Ending November 30, 1900 (Helena: Independent Publishing Company, 1900), 47. Manuscript of forthcoming book by Michael P. Malone and Richard B. Roeder.

206 Ibid.

207 "Montana Mines in 1897," EMJ (January 8, 1898), 43-44. Matt W. Alderson, "The Cyanide Process in Montana," EMJ (February 7, 1903), 221. See also Note 152.

208 Seventh Report of the Bureau of Agriculture (1900), 27-28.

209 Toole, Montana: An Uncommon Land, 167-210. In 1897 W. A. Clark consolidated his holdings. The same year the Boston and Montana Company and the Butte and Boston Company merged (164). In 1899 the Amalgamated Copper Company, a holding company for Standard Oil, bought Marcus Daly's Anaconda Company (194).

210 The papers appearing in the Journal of the Association of Engineering Societies, Volumes 26-37, indicated the increasing specialization of the Montana engineers. By the late nineties, railroad and surveying topics appeared less and less frequently.

211 Proceedings of the Fourteenth Annual Meeting of the Montana Society of Engineers (1901), Box 4, M. S. E. Collection, 7. Minutes of 1901 indicated that Goodale requested that the Secretary read the provision.

212 [Minutes], January 11, 1901, Box 3, Minutes of Annual Meetings 1900-1914, 15-16.

213 Ibid., 16-17.

214 "Proceedings," AES J, XXVI (1901), 24.

215 Ibid.

216 "Proceedings," AES J, XVIII (1897), 53.

217 Layton, The Revolt of the Engineers, 33ff. Calvert, The Mechanical Engineer, 203ff.

218 "Proceedings," AES J, IX (1890), 258.

219 Calvert, The Mechanical Engineer, 135.

220 Fourteenth Annual Meeting (1901), M. S. E. Collection, 7-8. Correspondence E. H. Beckler to Montana Society of Engineers, December 26, 1900, Box 3, File Minutes of Annual Meetings 1900-1914, M. S. E. Collection.

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