CHAPTER V

Expanding Frontiers

Pre-Mexican War Exploration

Exploration by Army officers dated back to the turn of the 19th century, with the expeditions of Meriwether Lewis and William Clark, Zebulon Pike,. and others. The first expeditions involving Topographical Engineers came a little later. Stephen Long, who figured prominently in many important endeavors during his long career as a Topographical Engineer, led the first trans-Mississippi parties for the topogs. Between 1817 and 1823, Long ranged far and wide in the West, surveying sites for Fort Smith on the Arkansas River and Fort Snelling up the Mississippi, marking a portion of the border between Minnesota and Canada, and trekking as far west as the Colorado Rockies. For all of his accomplishments in the West, as an explorer Long is remembered mainly for fixing the label "Great Desert" on the high plains. He pronounced the region "almost wholly unfit for cultivation and, of course, uninhabitable by a people depending on agriculture for their subsistence." Others, observing the lack of streams and forests, took the same view, but Long went down in history as the author of the myth.

During the 1820s and 1830s, the federal government focused its efforts on the vast triangle west of the Mississippi, north of the Missouri, and south of Canada. At first, competition with Britain for furs and Indian loyalty drove this effort. Later, the increasing number of settlers in Michigan, Wisconsin, and Minnesota, and rumors of rich metal deposits along Lake Superior, created the demand. Topographical Engineers were few, and the demand for their services farther east coupled with a lack of money for a concerted effort meant that only a few expeditions went into the Northwest. The two most important, led by the French scholar Joseph N. Nicollet in 1838 and 1839, resulted in an excellent map of the hydrographical basin of the upper Mississippi. The expeditions also introduced a young

In 1842 Frémont scaled Snow Peak in the Wind River Mountains and focused national attention on the route to Oregon through South Pass. Fifty years later, he still held the national imagination, as this stamp from the 1893 trans-Mississippi exposition series shows.

topog second lieutenant named John C. Fremont to western exploration.

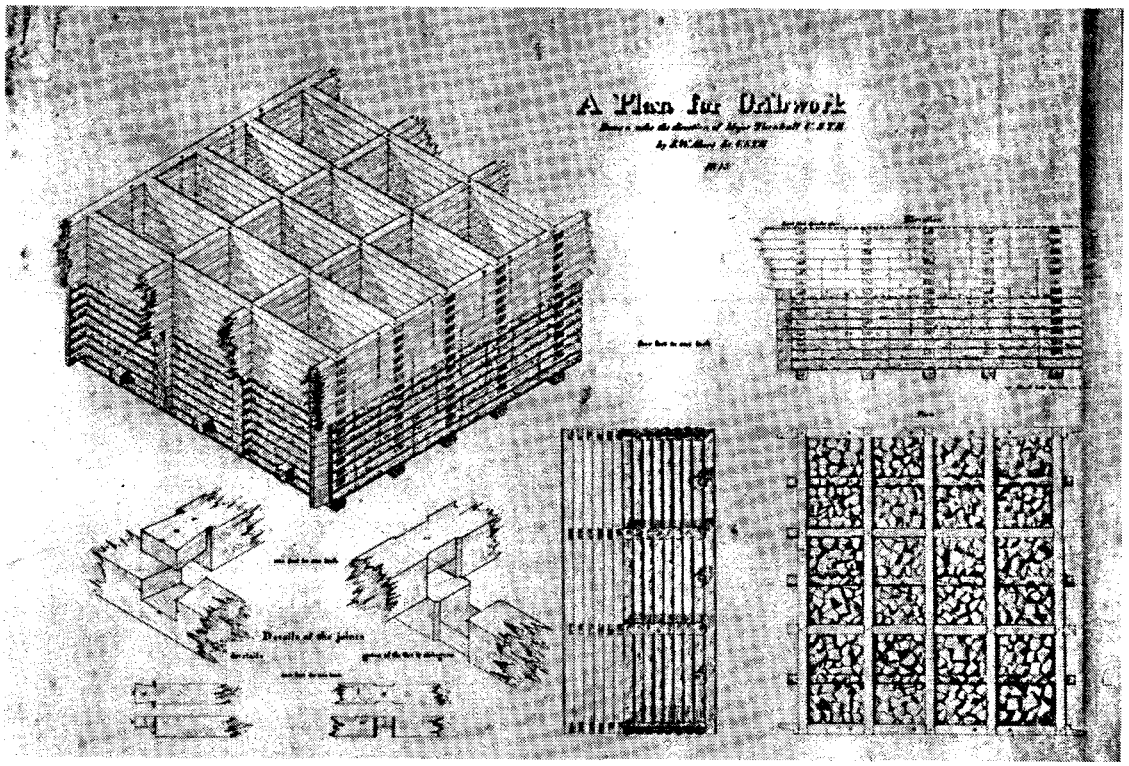
Fremont was the dominant personality in topog exploration during the first half of the 1840s. The nation was poised on the edge of a continental destiny, and the flamboyant "Pathfinder" turned all heads west toward Oregon and California. As much the agent of his father-in-law, expansionist Missouri Senator Thomas Hart Benton, as he was Abert's subordinate, Fremont led three expeditions between 1842 and 1846. The first dramatically publicized the easy South Pass crossing of the Rockies in what is now Wyoming. On the second expedition, Fremont identified the true character of the Great Basin, a vast internal drainage system that he circled on an eight-month 3,500-mile journey. The third expedition, his last for the bureau, put him in Mexican California at the onset of war. Once in California, he became involved in the Bear Flag revolt and the overthrow of Mexican rule. His reports, written with the help of his able wife Jessie, assaulted the notion of a Great American Desert and touted the possibilities of Oregon, California, and the valley of the Great Salt Lake.

Although Fremont grabbed the headlines, others made major contributions. Lieutenant William F. Franklin rode with Stephen Watts Kearny's Sioux expedition in **1845,** reconnoitering and mapping parts of present-day Nebraska, Colorado, and Wyoming. When Kearny went south the next year to command a column against Mexico, Lieutenant William H. Emory led a topographical party that mapped Kearny's route across the Southwest to California. He and his assistants also collected specimens of the fauna and flora along the way. Although overshadowed by the charismatic Fremont, the red-whiskered and quick-tempered Emory was a major figure in western exploration before leaving the topogs in the 1850s for faster promotion in the cavalry. While Emory was in California, Lieutenant James W. Abert the colonel's son, and Lieutenant William G. Peck scouted and mapped the valley of the Rio Grande, from Socoro to Santa Fe.

Western Roads

Behind the explorers came the surveyors and road builders. In the late 1830s while Nicollet examined the country between the Mississippi and Missouri rivers, the federal military road-building program centered on Michigan and Wisconsin territories to the east. The Topographical Bureau was solely responsible for this program, which included building eight roads in Michigan, seven in Wisconsin, and others in Iowa, Arkansas, and Florida. National defense was cited as a constitutional justification. The road program was tied to military requirements until the Civil War, and most federal roads in the West had at least one terminal at a military post. Nevertheless, the concept was sometimes no more than a convenient fiction. The eight Michigan roads of the territorial period all converged on the center of population at Detroit. Only the road to Fort Gratiot, needed when ice closed the St. Clair River, could truly be justified on a military basis.

The Wisconsin roads constructed under Captain Thomas Cram featured bridges built in accordance with a plan invented and patented by Stephen Long while working on the Baltimore and Ohio Railroad. Long's timber truss bridge claimed two firsts. It was built without an auxiliary arch and was the first to be based on mathematical calculations. It was later superseded by



a design that used vertical iron rods, but Cram successfully used the Long design for all spans over 20 feet long.

Abert's bureau took its road responsibilities seriously. Whenever possible, he assigned an officer to supervise a project; at other times he sent a civilian agent. Whether civilian or military, the superintendent carried out a preliminary survey to determine the best course of action and prepared cost estimates for the desired approach. Bureau review of the proposed course of action preceded the letting of any building contracts, which usually were awarded locally. The officer or agent in charge remained as supervisor and inspector until released from the duty by the War Department.

West of the Mississippi River, roads more often had genuine military purposes. However, they too were also built to ease the westward migration and for mail delivery, commerce, and agriculture. Over time roads constructed by the topogs in Iowa and other prairie states just west of the Mississippi contributed significantly to economic development.

Military Surveys

In the years prior to the Mexican War, the bureau did give some attention to military matters. Abert had learned his lesson from the Seminole War and did not want to be caught short

James Abert, a graduate of Princeton College as well as the Military Academy, was highly regarded by his peers for his drawings. These examples show his ability put to different uses. In 1845 he drew the cribwork plan, opposite page, for the Potomac River project while working in the Topographical Bureau's Washington office. A year later, he was at Bent's Fort preparing for a reconnaissance of New Mexico and drew the Indian portrait. Abert was injured during the Civil War and resigned in 1864. His later activities included spending eight years as a professor of English literature at Missouri State University, an improbable post-service job for an Engineer officer.

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again. Now was the time, he wrote in 1842, to finish such work while peace afforded the opportunity to do it right. His topographers conducted surveys for defense purposes at several places, ranging from the harbor at Portsmouth, New Hampshire, to the roads leading to and from Washington, D.C., but the emphasis was on two areas in particular, Florida and New Orleans. Abert called the New Orleans survey, finished in 1842, "extensive and minute." It ranged as far west as the Atchafalaya River, south to the Gulf of Mexico, and east to Cat Island. In Florida, much of the work concentrated on the southern coast. In 1845 Major Bache managed "the extensive survey of a military character which had been required of the shoals, reefs, and harbors at the southern extremity of Florida." The work took in the Florida reef from Cape Florida to the Dry Tortugas, the Dry Tortugas themselves, Key West harbor, Bahia Honda, and Boca Grande. With this effort completed in 1845, Abert turned his attention westward. The annexation of Texas, he knew, would require similar surveys on the coast and frontier of that area.

The Mexican War

When the Mexican War broke out in 1846, Abert's officers were soon too busy for systematic surveys of any kind. Rivers and harbors work was virtually suspended, and the Topographical

Bureau found itself with little to do. For the individual officers it was a different story. Two-thirds of the 36 men of the corps served in the field with various tactical commands during the war, independent of the bureau. Lieutenant Emory and his topographical detachment with Kearny came under fire near San Diego and participated in the Battle of San Pasqual. Captain Joseph Johnston commanded a regiment of mounted infantry and Captain George Hughes became military governor of the area around Jalapa and Perote northwest of Veracruz, with Emory as his lieutenant governor. Fremont played a prominent role in the conquest of California, and Long built steamships for the Quartermaster Department in Texas.

Topogs also played important roles in the major battles along the road to Mexico City. Major Turnbull saw action in all of the clashes between Veracruz and the capital as Major General Winfield Scott's chief topographer. He won two brevet promotions for gallantry in battle. George Meade, who was then still a second lieutenant, scouted enemy positions while under fire at Monterey and pinpointed weaknesses in the defenses of the city. Five topogs were in the thick of the fighting at Buena Vista in February 1847. One of them, Lieutenant Francis T. Bryan, fought with an artillery detachment. He showed no fear. His commander saw Bryan "when exposed to a close and murderous crossfire of grape and canister on one side, and musketry in front, direct the fire of his piece, and give his commands with the same coolness as if he were on parade." At Cerro Gordo, during the same campaign, Lieutenant George H. Derby crept close enough to Mexican positions to estimate the size and composition of the enemy force and artillery and map their locations. During the assault, he was wounded while directing artillery fire.

Two topogs died during the war. In May 1846 Lieutenant Jacob E. Blake was killed when his own pistol accidentally discharged. Four months later, Captain William Williams, General Zachary Taylor's chief topographer, died of wounds received in the Battle of Monterey.

Even in the middle of the campaign for Mexico City, the rivalry between topogs and Engineers flared. Colonel Totten himself commanded the Engineer contingent at Veracruz and made sure his men dominated the topogs. Meade complained to his wife about the situation. "For my individual part," he wrote,

"I have been pretty much a spectator for a week, the Corps of Engineers having performed all the engineering that has to be done. This is attributable to the presence of Colonel Totten, who wishes to make as much capital for his own corps, and give us as little as possible."

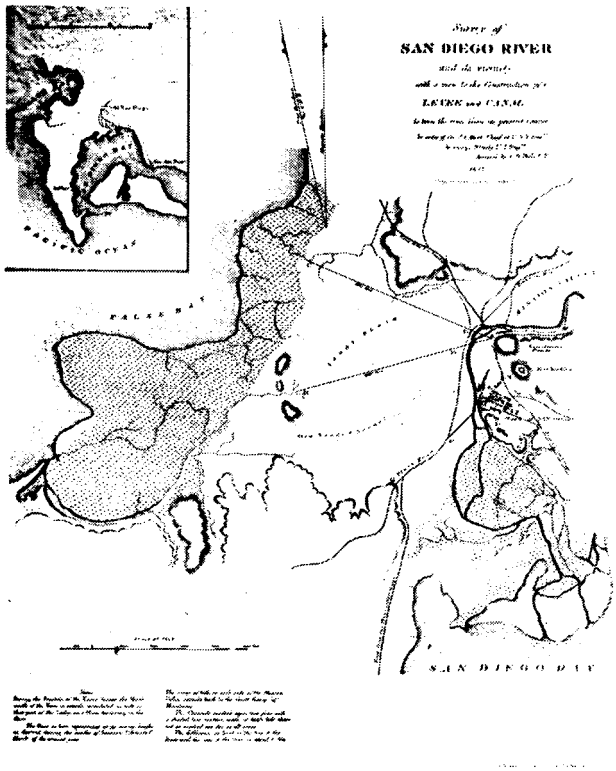
Despite Totten's efforts, Colonel Abert still had reason to speak proudly of his officers. The topogs, he said, showed "the versatility of talent in the Corps and its ability to fulfill any military duties which it may be found necessary or proper to assign to it." He was right. As explorers and cartographers, and as naturalists and soldiers, the topogs were as much a part of the Mexican offensive as officers and men of the line.

The Southwestern Reconnaissance

The Mexican War directly spawned two major efforts that involved the topogs in the Southwest: a survey of the new border with Mexico and a survey of the vast territories acquired as a result of the war. Numerous expeditions, with assignments tailored to fit the needs of specific locales, went into the Southwest. Some places required initial exploration; other more settled areas needed roads to connect towns and forts. Elsewhere, topogs located sites for military posts and railroad passes, reconnoitered rivers, and improved harbors. From the Grand Canyon of the Colorado to the Great Salt Lake and from San Antonio to San Diego, the topogs crossed and recrossed the Southwest, examining the new country and binding it to the old.

In Texas, where the great need was for roads, Joseph Johnston, now a lieutenant colonel, supervised the efforts of four topogs and one Engineer. From 1849 to 1851, they overcame a variety of obstacles-from Apache marauders to the dry tableland between the Concho and Pecos rivers-to lay out a system of transportation and communication that tied the forts and towns together. The reconnaissance ended just before the Civil War on an unusual note, with two expeditions under topog Lieutenant William H. Echols using camels as pack animals. The camels proved well suited to the dry country, but were universally disliked for their odor, growl, and bad temper.

The topogs were also busy elsewhere in the newly acquired territory. In New Mexico, Lieutenant James H. Simpson made discoveries of lasting scientific importance. In Chaco Canyon



In the years after the Mexican War, the process of expansion was so rapid that the stages of development overlapped. Lieutenant Derby's map of the San Diego area was produced in conjunction with a harbor improvement project in 1853, just as Lieutenant Williamson began to probe the mountains to the east for a pass that might be suitable for a railroad. Derby's work in San Diego was the first Army Engineer civil works project on the Pacific Coast.

and in Canyon de Chelly, he found some of the most important archaeological sites in the United States: ancient Indian pueblo communities of stone, mortar, and wood. Accounts of the pueblo cultures still begin with references to Simpson's discoveries. Captain Macomb, fresh from 14 years with the Great Lakes Survey, completed several roads through New Mexico in 1856 to 1859. Captain Howard Stansbury and Lieutenant John W. Gunnison picked up where Fremont had left off in the valley of the Great Salt Lake in 1849, and Simpson laid out a shortcut through the basin to California.

In California, Captain William H. Warner examined routes between San Diego and San Francisco before leading an expedition east into the Sierra Nevada with Lieutenant Robert S. Williamson. In September 1849, Warner and a guide were killed in an ambush by Indians. Williamson recovered his notebooks and withdrew to Sacramento to compile a report and map. Meanwhile, Lieutenant Derby started the first rivers and harbors project west of the Mississippi, an attempt to improve the harbor at the mouth of the San Diego River. Topographer Derby was also known as the humorist John Phoenix, a punster who denied requisitioning a lathe with which to turn the river but who admitted having been sent to dam the river "and that he had done it (mentally) several times since his arrival."

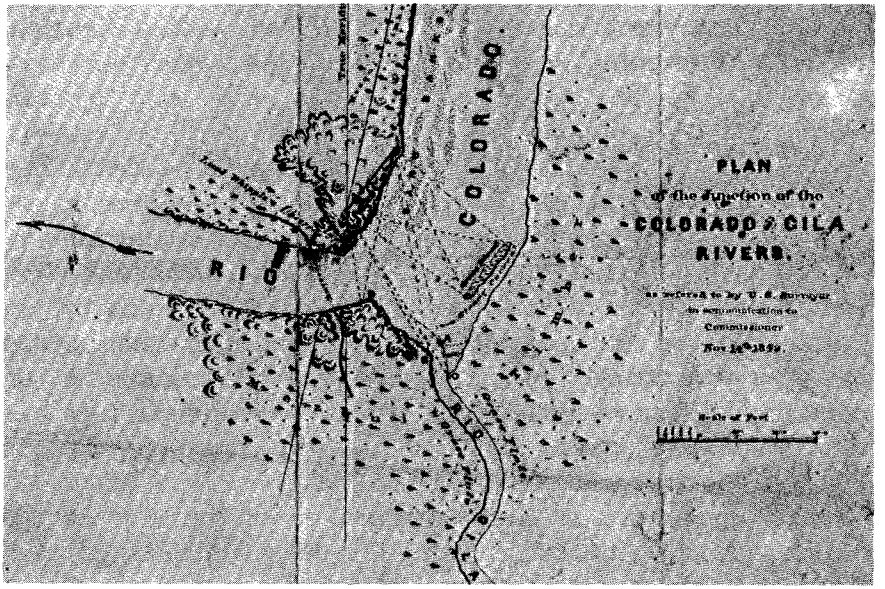
The southwestern reconnaissance ended with a flourish. Lieutenant Joseph C. Ives led a party up the largely unknown Colorado River. The expedition started as an attempt to determine the navigability of the river upstream from the crossing at Fort Yuma. From the head of navigation at Black Canyon, Ives struck out overland. The journey gave him the chance to see what no scientist before him had seen, the vast eroded plateau and gigantic gorges of the Grand Canyon. He also made the first exploration of the canyon floor. Awed though he was by the grandeur of the canyon, Ives was still an engineer who thought in terms of practical applications. For the canyonlands he saw none and so dismissed them as "altogether valueless." He was the first white visitor and expected to "doubtless be the last ... to visit this profitless locality."

The topog work in the Southwest eased the way for the nation's growth while contributing to a deeper understanding of the natural and human history of the continent. The period was the heyday of the topogs, their busiest and most productive period as explorers.

Boundary Surveys

By the time of the Mexican cession, the Topographical Engineers had ample experience with boundary surveys, dating back to before the formal establishment of the corps. In the 1830s such work involved state borders and the lines between lands ceded to various Indian tribes. Sometimes this latter category produced some anxiety. Captain Washington Hood, who had run the Ohio-Michigan line in 1835, was assigned four years later to mark the borders between several tribes west of the Mississippi, among them the Iowa, Sauk, Kickapoo, and Shawnee. Hood considered the original survey by the Bureau of Indian Affairs to have been less than exact, but advised against an accurate resurvey. "The result of our surveys carried out would," he wrote, "cause a clashing among all the tribes bordering upon the frontiers of Arkansas and Missouri; would create the greatest mass of confusion and discontent-therefore the uncertainty which rests upon my mind as to how I should proceed." Abert did a quick calculation of possible benefits and costs and recommended against the project.

Projects in the 1840s included surveying several state boundaries, the very temporary line separating the United States from



Lieutenant Amiel W. Whipple drew this map during the survey of the boundary with Mexico. The map shows the lines of triangulation from a baseline along the bank of the Colorado opposite the mouth of the Gila. Initially, the Gila was supposed to form part of the boundary between the two countries. After only eight days at this location, Whipple noticed that the river already had erased a long sandy point at its mouth. Hence, it would not serve as a fixed point for the boundary. A major when the Civil War broke out in the spring of 1861, Whipple became a brigadier general of volunteers and commanded a division. He was fatally wounded at Chancellorsville in May 1863.

the Republic of Texas, and the northeastern portion of the border with Canada. The combined field and office work for this effort lasted a decade. James Graham, then still a major, headed the survey team, which was detached from the bureau for the duration and assigned to the State Department. Abert disliked the arrangement and complained that Graham should have continued to work for the bureau, which was accustomed to directing surveys and could best judge their success. An 1848 fire destroyed many of Graham's maps, but because the bureau had taken its normal precautions and stored the notes separately from the final maps he was able to reconstruct them from his original field notes.

The long drawn-out Mexican boundary survey was at least as difficult and complex as any of its predecessors. Political appointees ran the commission, and the Corps of Topographical

neers provided the professional talent, with Lieutenant Colonel John McClellan, James Graham, and Emory leading the topog contingent at various times. There were problems aplenty. Indian raids, boondogglers, and disputes with the Mexicans over the location of the boundary intended by the Treaty of Guadelupe Hidalgo all complicated the survey. Furthermore, the boundary sometimes moved. Lieutenant Amiel Whipple, at the junction of the Gila and Colorado rivers, noticed that the Gila had eroded away a long sandy point at its mouth in a mere eight days. The river, designated by the treaty as part of the boundary, did not always run in the same bed. This problem remained until the Gadsden Purchase, surveyed by a commission under Emory in 1854 and 1855, established a new and more reliable border.

In addition to determining the boundary, the survey achieved enduring scientific results. The scientists and collectors who accompanied the field parties accumulated a remarkable amount of data and great quantities of natural history specimens. These collectors and their colleagues in the East, who analyzed the data for publication, contributed substantially to scientific knowledge of the borderlands. Some of the greatest men in American science participated in the collection, organization, and publication of the commission's field acquisitions. Louis Agassiz, John Torrey, James Hall, and the Smithsonian's Joseph Henry and Spencer Baird all lent their talents to the enterprise. Emory's report was his last and greatest contribution to geographic knowledge. Thorough, precise, and well illustrated, it faithfully depicted the borderlands. It included accounts of the survey, and field reports on geology, botany, and zoology, together with the findings of the scientists who classified the specimens. The scientific achievement contrasted with the political troubles that dogged the survey.

Post- Mexican War Western Roads

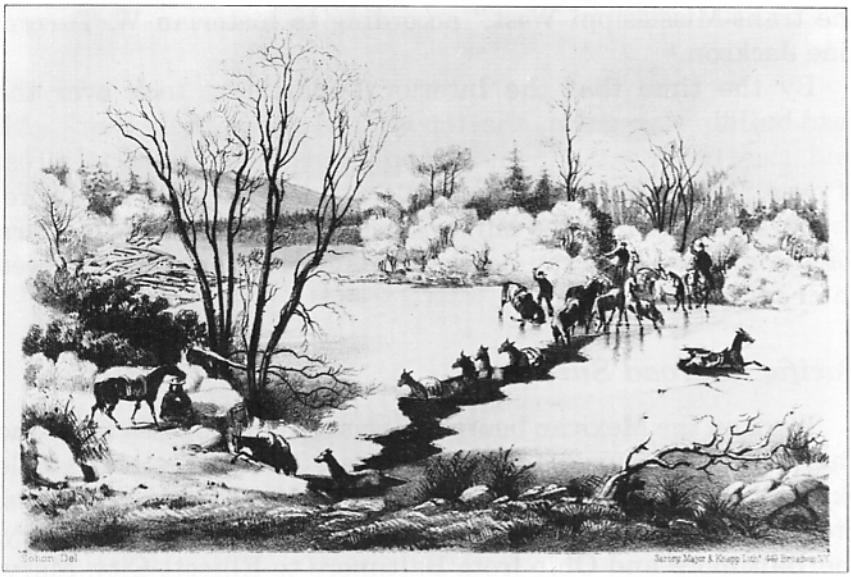
The period following the Mexican War accelerated and complicated the usual process in which road building followed exploration and railroads came later still. After the vast Mexican cession was added to the national domain, all three phases of the process took place simultaneously, sometimes in the same region. Johnston's Texas reconnaissance included expeditions

that combined explorations and road surveys. Pacific Coast communities, more fully developed than some interior areas, were further along in developing transportation systems. So while Ives probed the Grand Canyon, road construction programs were under way in Oregon, Washington, and California as well as in Minnesota, Nebraska, and Kansas. Not only was the process becoming jumbled, but California-bound gold-seekers rushing across the continent demanded a different style of building. Speed rather than comfort became the overriding consideration. The new emigrants were satisfied with just a trace of a road as long as it was adequate for wagons. With this criterion, the shortest route with enough water, wood, and grass was the best.

Just as with rivers and harbors work, Abert set up field offices to handle western roads. The most active were the Office of U.S. Government Roads in St. Paul, Minnesota, and the Office of Military Roads, Pacific Coast, which worked first out of San Francisco and later at Fort Vancouver, Washington. The work in the Pacific Northwest, which centered on an effort to connect the Columbia River to the Missouri, was handled somewhat differently than the Minnesota project, with construction done by employees of the office rather than by contractors.

Congress took the topogs out of the road-building business in 1856. Congressional impatience with the time-consuming military surveys that always preceded actual construction led to the formation of the Pacific Wagon Road Office in the Department of the Interior. Albert H. Campbell, head of the new office, had worked with topog explorers and shared the legislators' dislike for the Army way of road building. He opposed the system of awarding jobs to the lowest bidders, who invariably seemed to run out of money before they finished, forcing Campbell to turn to Congress for more. He believed that in cases where roads had to be built with a single appropriation, a bonded superintendent and an engineer, both with fixed salaries, should hire and supervise their own work crews.

Campbell too had his problems. His civilian engineers did their jobs well enough but his superintendents, who had more political influence than managerial talent, proved inept. Three were convicted of fraud, and overall the office's record was poor; "the gloomiest in the history of federal aid to road building in



Each season held perils for exploring parties. Both illustrations from the report of the Pacific railroad survey led by Isaac Stevens show members of the expedition crossing the Hellgate River. In the case above, they braved winter ice; in the other, spring runoff.

the trans-Mississippi West," according to historian W. Turrentine Jackson.[1]

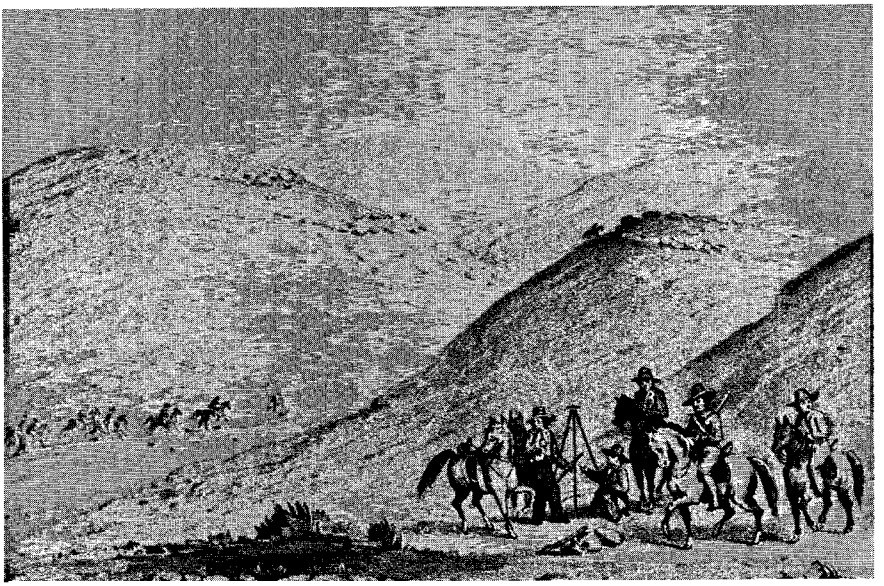
By the time that the Interior Department took over the road-building program, the topogs had made their mark. All told, they built 34 trans-Mississippi roads in the 1850s at a cost of over $1 million. In Minnesota, New Mexico, and elsewhere, Topographical Engineer surveys determined the basic pattern for the modern highway network. Many railroads also followed their routes.

Pacific Railroad Surveys

Work on the Mexican boundary was still in progress when the Pacific railroad surveys got under way. The topogs had ample experience with railroad routes by the 1850s. Late in the 1820s, Stephen Long had surveyed the first railroad line in the country, the Baltimore and Ohio from Baltimore to Ellicott City, Maryland. Closer to the starting point of the trans-Mississippi lines, topogs had done the preliminary survey for a railroad from Milwaukee to the Father of Waters. In addition, the surveys represented a logical step in the development of the national transportation routes. Officers involved in the enterprise understood the progressive relationship between exploration, wagon-road surveys, and railroad work. Instead of being an innovation, the surveys represented an acceleration of the federal effort to improve these routes.

While the surveys did represent a logical next step, the politics of the situation set them apart. Essentially, the Pacific railroad expeditions were an attempt to impose an engineering solution on a political problem. The law requiring the surveys included no suggestion of the political basis. The act of 3 March 1853 blandly authorized Secretary of War Davis to use part of the' Corps of Topographical Engineers "to make such explorations and surveys as he may deem advisable, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean"; provided $150,000; and required a report to Congress by February 1854. But the reason for the survey was plain. Congress, beset by many conflicting

[1] W. Turrentine Jackson, *Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 18464869* (Berkeley: University of California Press, 1952), p. *325.*



This drawing of a party of Lieutenant Williamson's Pacific railroad survey at work in Livermore Pass appeared in Williamson's report.

interests, could not settle on one best transcontinental route. So the legislature directed the Topographical Engineers to reconnoiter several potential lines, burdening Davis with the choice of the best route based on data compiled by field parties. Presumably, the topogs' impartial analysis would succeed where partisan politics had failed.

Bypassing the Topographical Bureau, Davis set up a new agency, the Office of Pacific Railroad Explorations and Surveys, to administer the program. Major Emory directed the office, which was charged with assessing the data generated by the surveys. When he left in 1854 to survey the Gadsden Purchase line, Captain Humphreys took over. This was a complex assignment: each expedition was to report on the many determinants of railroad construction, among them distances, grades, mountain passes, canyons, bridge sites, and tunnels. Each survey also had to consider natural resources, particularly timber, stone, coal, and water, all of them important for building and operating a railroad. With a number of scientists, including geologists, mineralogists, and naturalists accompanying each party and participating in the inquiry, the surveys provided an outstanding opportunity for science to influence national policy.

Of many possible routes, four that had substantial congressional backing were chosen for scrutiny. The northernmost survey was the only one not led by a Topographical Engineer. Former Engineer officer Isaac I. Stevens, on his way west as the newly appointed governor of Washington Territory, examined a route between the 47th and 49th parallels from St. Paul, Minnesota, to Puget Sound. Topog Captain John Gunnison led a party over the central route that started along the 38th parallel by way of the headwaters of the Arkansas to the Great Salt Lake, then shifted north along the 41st parallel. Gunnison was killed by Indians in an ambush near Sevier Lake in Utah and artillery Lieutenant Edward G. Beckwith, who commanded the escort, finsihed the survey. Farther south, Lieutenant Whipple commanded the 35th parallel survey from Fort Smith, Arkansas, to California via Albuquerque. The southernmost route along the 32d parallel, through Texas and the Gadsden Purchase, was surveyed by two expeditions, one under Lieutenant John Pope and another under Lieutenant John G. Parke. Other parties under Parke, Abbot, and Williamson probed the mountains of Oregon and California for railroad passes.

Captain Humphreys, assisted by Lieutenants Abbot and Gouverneur K. Warren, evaluated the data and prepared cost estimates based on distances, terrain, and the experiences of railroad builders east of the Mississippi. Calculations showed that all of the proposed lines would be tremendously costly. The least expensive 32d parallel route would cost about $69 million, which equaled the entire federal budget for 1856. Moreover, there was no clear-cut best choice from an engineering standpoint. The other three routes seemed practicable albeit more expensive. Indeed, after the Civil War, transcontinental lines were built on or near all four routes. For the time, Congress remained deadlocked. Critics attacked the cost estimates produced by the surveys from both sides; for either inflating or understating the cost. Some claimed the 32d parallel route, so near the border and therefore vulnerable to disruption in a war, was absurd. So the surveys, designed to clarify the issue, only clouded it.

As a scientific enterprise, on the other hand, the project had remarkable and enduring results. The field parties amassed a vast quantity of specimens and scientific data. With the help of scholars in eastern cities, the accumulation provided a compre-

hensive record of trans-Mississippi fauna and flora, geological structure, and geographical features. The 13-volume final report immediately became famous. The huge compendium was widely discussed in the daily press, in popular magazines, and in the streets and homes of America. The report is still well known to naturalists. As A. Hunter Dupree concluded in his study of the federal government and science, "to the student of the fauna, flora, and geology of the West, the volumes still seem as live and as important as they seem futile to the political historian."[2]

Lieutenant Warren's map of the trans-Mississippi West ranked high among the accomplishments of the survey. The completion of this cartographic milestone marked the close of an era for the topogs. A few voids remained. The little-known parts of the West still to be charted included the Nebraska sandhills and the upper reaches of the Yellowstone River. Nevertheless, an essential task had been completed. For nearly 40 years, since Long's trek to the Rockies in 1819, topogs had charted portions of the vast West. In 1858 the basic contours of the enormous region were at last understood and a general map was readily available.

The Isthmian Canal Route

The Isthmus of Darien in Colombia was far removed from the scene of the Pacific railroad surveys. However, when Congress authorized a survey of a canal route across latter-day Panama, a topog became involved there as well. Indeed, despite the remoteness of the site, the purpose was similar to that of the surveys across the United States. All of them sought ways to connect the new western portions of the country, especially the Pacific Coast, with the older East.

The canal project was a joint enterprise, under overall management of the Navy Department, to which topog Lieutenant Nathaniel Michler was detached. He was assigned to do the topographical surveys of land and river sections of a route across the isthmus via the Atrato and Truando rivers. Navy Lieutenant Tunis Craven did the hydrographical examinations of the harbors at each end.

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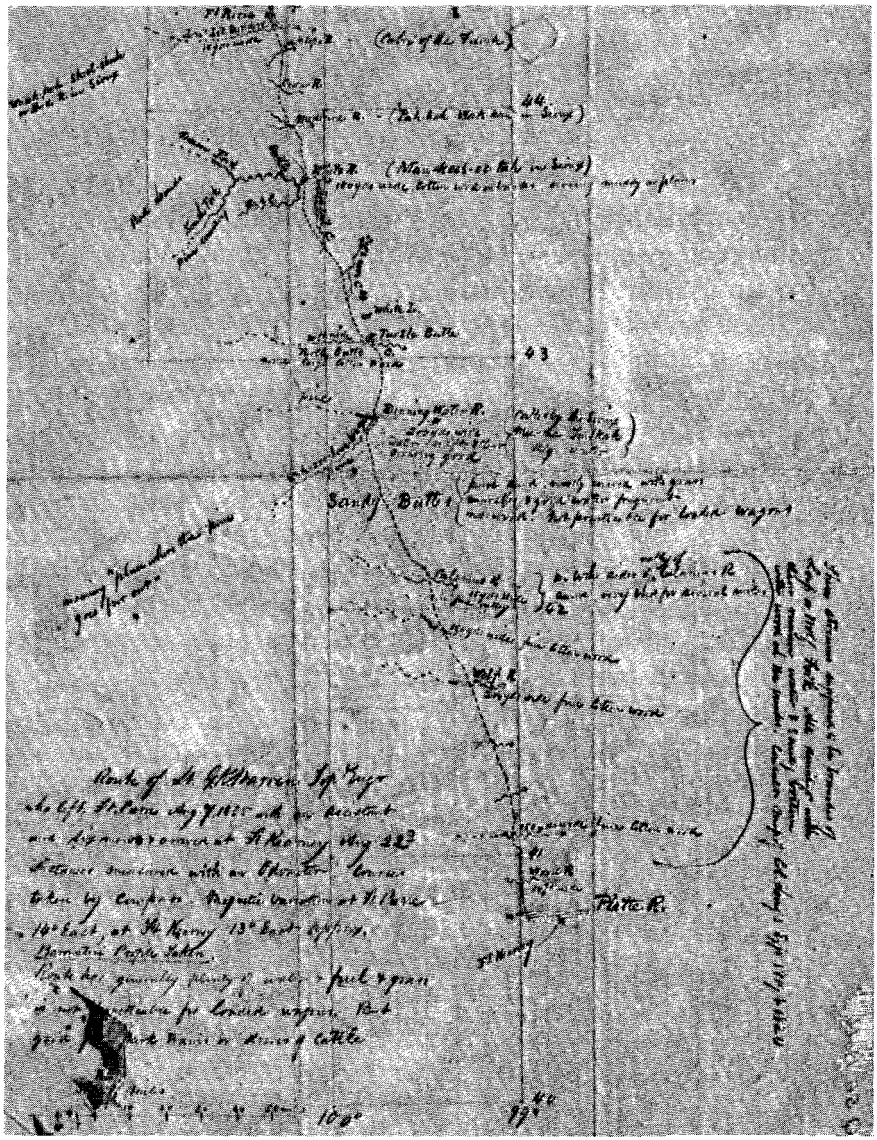
[2] A. Hunter Dupree, ***Science in the Federal Government, A History of Policies and Activities to 1940*** (Cambridge: Harvard University Press, 1957), p. 95.



During 1855-1857, Lieutenant Warren went on three expeditions to the northern plains. The latter two, under his command, filled blanks in the map he was compiling for the Pacific railroad surveys. But the first, for which he did this route reconnaissance from Fort Pierre to Fort Kearny, was a punitive expedition against the Sioux. Warren's notation on the bottom left of the map shows the kinds of questions Topographical Engineers asked about the routes they examined: "Route has generally plenty of water & fuel & grass, is not practicable for loaded wagons. But good for pack trains or droves of cattle."

The party set sail from New York in December 1857 and spent much of the next year carrying out the mission. In the tradition of Fremont, Michler wrote a vivid, and at times even dazzling, account of his experiences amid the exotic fauna and flora of Panama. He ran out of money after returning, but Abert managed to convince Congress to provide additional funds so he could complete his map. Sandwiched between Michler's more prosaic assignments, surveying a road westward from Arkansas and running the Maryland-Virginia border, his survey marked the first involvement of Army Engineers in considering an isthmian canal project.