

THE GOLDEN SPIKE

A CENTENNIAL REMEMBRANCE



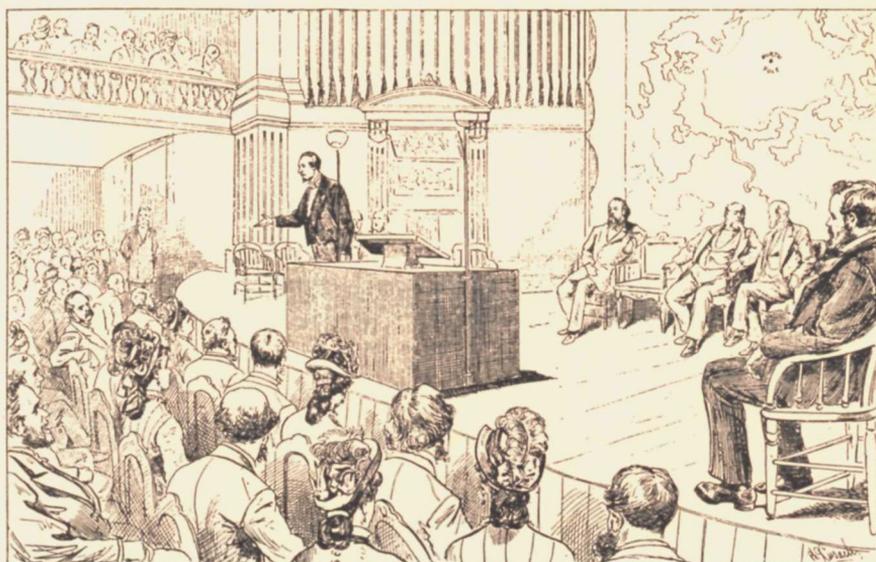
AMERICAN GEOGRAPHICAL SOCIETY

THE GOLDEN SPIKE

AMERICAN GEOGRAPHICAL SOCIETY

Occasional Publication No. 3





An early meeting of the Society.



Seal of the Society used in the
Proceedings (1861-1865) and *Journal*, (1873-1881).

AMERICAN GEOGRAPHICAL SOCIETY
OCCASIONAL PUBLICATION NO. 3

WILFRID WEBSTER, *Editor of Special Publications*

THE GOLDEN SPIKE
A CENTENNIAL REMEMBRANCE

E. Roland Harriman, Alfred D. Chandler, Jr.
Henry V. Poor, Lewis W. Douglas, James Douglas,
and Lynn S. Mullins

AMERICAN GEOGRAPHICAL SOCIETY
Broadway at 156th Street • New York

1969



Copyright, 1969

By the American Geographical Society

Library of Congress Catalog Card Number 70-77187

PRINTED IN THE UNITED STATES OF AMERICA

Basso Printing Corp., New York

PREFACE

The American Geographical and Statistical Society of New York was officially founded in 1852. In the following two decades, according to the history of the Society by John K. Wright, the members "heard more papers on the Pacific Railroad and other aspects of the westward movement than on any other comparable topic." It is fitting, therefore, that in 1969, the centennial of the driving of the Golden Spike, the Society should publish this little book, reprinting three of these early papers. The first two, by Henry V. Poor, discuss the geographical aspects before construction took place. The third, by James Douglas, surveys the geographical situation in 1885 shortly after the last of the five major routes was completed.

The Foreword has been written by E. Roland Harriman, a Fellow of the Society for over fifty years, who has been much concerned with American railroads. Mr. Harriman notes the importance of the transcontinental railroads to the growth and development and strength of the United States during the hundred years of their existence.

To introduce the papers and their authors, Alfred D. Chandler, Jr., a great-grandson of Henry V. Poor, and Lewis W. Douglas, a grandson of James Douglas, have kindly written short notes. Dr. Chandler is Professor of History and Chairman of the Department of History of Johns Hopkins University, Baltimore, Maryland. Mr. Douglas, former American Ambassador to Great Britain, is now living in Tucson, Arizona.

Miss Lynn S. Mullins, Assistant Librarian of the Society, has contributed a bibliographical essay on the major sources of information on the development and expansion of the network of railroads in nineteenth-century America. The photographs are reproduced from original glass-plate negatives made by a relatively unheralded photographer, Andrew J. Russell, which are now in the possession of the Society.

The Society is deeply appreciative of a grant from the Union Pacific Railroad Foundation, which has made possible the publication of this book.

On May 10, 1869 the Golden Spike was driven at Promontory, Utah Territory. On the centennial of this significant event, which changed the geography of America, the Society is glad to publish this book—a geographical remembrance. Geography played a key role in the planning and building of the transcontinental railroads a century ago.

SHANNON McCUNE
Director

FOREWORD

In an era in which distance is often measured, not in miles, but in light years, it may seem odd at first glance—or even oldfashioned—for the American Geographical Society to give heed to the Golden Spike Centennial to be celebrated at Promontory, Utah, on May 10, 1969. In an age in which we cross oceans and continents in less than a day, there are those who may find the inscription on the simple monument at Promontory a bit flowery:

The last rail is laid! The last spike is driven! The Pacific Railroad is completed! The point of junction is 1,086 miles west of the Missouri River, and 690 east of Sacramento City.

Viewed in the context of its time, however, the message Leland Stanford and T. C. Durant telegraphed to the White House and to all the waiting nation is modest indeed. A mere 1776 miles of railroad track? Little indeed to Space Age geographers. Yet a generation of pioneers who had built new homes in the western wilderness reflected on those long miles often and sadly. Having trudged across the mountains, prairies, and deserts of a continent, they were effectively removed forever from the civilized East.

How important was construction of the first transcontinental railroad to the development of our nation? Reading the papers that follow, one realizes again and again how *right* they were, those prophets of the iron horse, how correctly the railroad builders foresaw the needs of their western neighbors to span those awesome miles, how correctly they foresaw the economic, political, and social miracles that must follow the rails. Henry Varnum Poor, writing long before the first tie was laid and the first spike driven, quite correctly foresaw the engineering, logistical, and fiscal problems inherent in our continent's geography—but quite correctly counseled that a rail line must be built. After the initial railroads spanned the na-

tion, James Douglas could quite correctly speak with pride of the tenacity of the railroad builders, praise the enterprise of his contemporaries, and muse upon the great days that lay ahead.

A centennial year is, of course, a time for looking back—not merely with nostalgia but with pride. And those whose careers are closely linked to the development and operation of the nation's western railroads can, in looking back across the years toward Promontory, take considerable pride in the accomplishments of the railroads, and of railroaders. By now, a century after the big doings at Promontory, at which the Union Pacific and Central Pacific celebrated their juncture, the transcontinental railroads have made possible the carving out of a great new empire in America West. Five times in that century, during three full-scale wars and two undeclared armed conflicts, the railroads carried the military by the millions, plus the mountains of their equipment—another service foreseen by the builders of the initial transcontinental route.

Precise ton miles and passenger mileage figures for the vanished century are at once incalculable and unimportant. What is important, and what will at once be recognized by members of the American Geographical Society, is the fact that today's railroad miles are efficient miles, easy miles, miles that have made life easy and profitable, in the best sense, in all the vast American West and, in turn, have enriched the East with treasure from mine, forest, and field. The engineers who surveyed the West for those first rail lines, the builders who laid ties and rails, the men who put up the money, the operators of the first trains, among them, made possible the mapping and the construction of the paved highways and freeways, the airports and even the airways which now crisscross the nation.

Little wonder, then, that the American Geographical Society gives thought to what took place on a barren stretch of Utah upland one hundred years ago. Better than they knew, the men who drove the Golden Spike were changing our geography, shrinking the bitter miles, and challenging the mapmakers and their measurements of space and time.

CONTENTS

Foreword by E. Roland Harriman

Henry Varnum Poor, The American Geographical Society, and The Pacific Railroad	1
Alfred D. Chandler, Jr.	
Railroad to the Pacific	6
Henry V. Poor	
The Proposed "Pacific Railroad"	26
Henry V. Poor	
Dr. James Douglas: An Appreciation	48
Lewis W. Douglas	
Historical and Geographical Features of the Rocky Mountain Railroads	53
James Douglas	
The Railroad in History: A Bibliographical Introduction	99
Lynn S. Mullins	





Henry Varnum Poor

**HENRY VARNUM POOR,
THE AMERICAN GEOGRAPHICAL SOCIETY,
AND THE PACIFIC RAILROAD**

ALFRED D. CHANDLER, JR.

Henry V. Poor developed his long and enthusiastic interest in the Pacific Railroad through his association with the American Geographical and Statistical Society. A Maine lawyer who had married into a family of ministers and reformers, he had come to New York in 1849 to edit *The American Railroad Journal*. As editor, he developed a passion for the collection of accurate information about railroads and about the larger American economy. This interest led in time to publishing annually his well-known *Manual of the Railroads of the United States*. It was this interest, too, that brought Poor to join with like-minded New Yorkers in 1852 to form a society for the systematic collection and diffusion of statistical and geographical information. As long as he lived in New York, he helped the Society carry out its aim, serving at various times during the fifties and early sixties as librarian, secretary, councilor, and as a member of numerous committees. In 1859 he became the editor of its first organ, *The Bulletin of the American Geographical and Statistical Society*, one of the more important early scientific journals published in the United States.

The editor rarely missed a meeting of his Society. There he and Mary—for Henry often brought his wife to hear the lectures and papers—thoroughly enjoyed seeing old friends and making new ones. At these meetings the Poors talked with

Henry Grinnell, Alexander Isaac Cotheal, William C. H. Waddell, Marshall Lefferts, Archibald Russell, and other prominent New York men of business. There the Poors saw regularly the Reverend Joshua Leavitt, a close friend of his wife's uncle, Lewis Tappan, and the editor of the *Independent*, an outspoken journal of reform; Hiram Barney, one of Lewis Tappan's sons-in-law, and an associate of William Cullen Bryant on the *Evening Post*, and George Bancroft, the historian. Besides talking with these business and literary men, Henry Poor at the meetings met such geographers as Matthew Fontaine Maury and Arnold Guyot, such explorers as Elisha Kane, and such cartographers and statisticians as John Disturnell and J. Calvin Smith.

Henry Poor became almost at once the Society's most active cartographer. In 1854 he was given charge of constructing a large 15x30 foot map of the United States on which the proposed routes of the Pacific railroad were to be depicted. The map, drawn to the scale of six inches to a degree, was executed, under Poor's supervision, by George Schroeter, the society's first paid assistant. It was complete enough by June 1854 for Poor to use it to illustrate the paper he delivered to the society on the Pacific railroad. In 1855 Poor traced on a revised copy of this map all the railroads then in operation or under construction in the United States, listing in the margin the names of these roads and giving their lengths. This map, regularly revised, undoubtedly became the master chart for the railroad maps of the United States which Poor published annually as a supplement to the *Railroad Journal*.

Besides giving Poor a useful training in map-making, the Geographical Society helped him to keep abreast of current statistical developments. Its library was at that time one of the best sources of statistical information in the United States. Moreover, in the Society's quarters Poor often consulted with some of the very few professional statisticians, compilers, and gazetteers in America, including Disturnell, J. Calvin Smith, Richard S. Fisher, and one of the earliest theoretical statisticians in this country, Archibald Russell. Poor's interest in geography, cartography and social statistics strongly affected the caliber and content of the *Railroad Journal*, and in turn

his editorial work for the *Journal* quite naturally stimulated his interest in geography and statistics. Poor was one of those fortunate men for whom the line between vocation and avocation is slim. Both reflected what he liked to consider one of his major objectives in life—the acquisition of useful knowledge to be applied to useful ends.

Henry Poor gave his long talk to the members of his Society on the Pacific railroad in June 1854, after completing a lengthy investigation of the different routes proposed. He had been skeptical of optimistic plans for building a transcontinental railroad in a short time and at relatively little cost. He had long been impressed by the enormous engineering difficulties involved in completing such a road. For these reasons Poor had been one of the very few to speak out against Asa Whitney's scheme, in 1849, to build a Pacific railroad, for Whitney's plans rested on the hope that the road would pay for itself by the sale of lands along its right of way.

After delivering his talk which the Society published in its *Bulletin*, Poor constantly stressed two points in his editorials in the *Railroad Journal* on the Pacific railroad. First, he continued to insist that more accurate information about the prospective routes must be known before any intelligent positive action could be taken. Throughout the later 1850s he urged Congress to appoint a commission of able engineers to follow up the hurried and most incomplete preliminary surveys made between 1853 and 1856.

Next, Poor urged the nation's legislature to think more realistically about costs. By the mid-1850s he had become certain that, even under the most favorable engineering conditions, the cost of a well-built transcontinental road would be over \$100,000 a mile. At such a cost, proceeds from land sales could never pay for the road's construction. For one thing, much of the land along the line of any railroad to the Pacific was then almost worthless. Moreover, as the experience of the Illinois Central was showing, several years were required before a railroad received any sizable amount of revenue from the sale of even the best lands. Nor did the editor of the *Journal* any longer expect private capital to make up the balance of the funds required for construction. He was quite

certain that the road, once in operation, would be unable to make enough beyond its necessarily heavy running expenses to meet the interest charges on any large loan from private individuals. The road would, he feared, "never become a channel of commerce—not even for the 'Teas and Silks of China.' Its business will be mainly confined to passengers, the mails and the precious metals." Important as such traffic was to the nation, it would hardly provide the large volume of trade necessary to make a railroad profitable.

By 1858 Poor had reluctantly decided that the Pacific railroad must be financed and built by the federal government. Although government construction "will necessarily increase its cost and delay its completion," Poor saw no other way to obtain this essential link between East and West. Also, if the road was able, as he hoped it might be, to help unify the nation, then its construction by the government would be well worth the extra cost. "We have little nationality, and are fast losing the little that we have," Poor wrote in January 1858. "In a railroad to the Pacific we have a great national work, transcending, in its magnitude, and in its results, anything yet attempted by man. By its execution, we are to accomplish our appropriate mission, and a greater one than any yet fulfilled by any nation." And this mission was to establish "our empire on the Pacific, where our civilization can take possession of the New Continent and confront the Old."

Poor's faith in the Pacific railroad as an agent in America's "Manifest Destiny," combined with his caution and conservative approach to the problems of its construction and finance, and his own writing and cartographical work on the road for the Geographical Society gave him a reputation as an expert on the subject of a railroad to the Pacific. This reputation had much to do with his appointment in July 1862 as one of the five government commissioners to the newly chartered Union Pacific Railroad Company.

At a meeting held in September 1862 to draw up the Union Pacific's preliminary organization, Poor was elected provisional secretary. On his return to New York he found himself the company's only full-time officer. For more than a year he shouldered not only the routine work of organizing such a

venture, but also the responsibility of raising the capital to meet the requirements of the charter. The paper Poor read at the Geographical Society on June 11, 1863 was one of the few talks that he gave as part of his campaign to encourage stock subscription in the Union Pacific. He relied more on correspondence and personal calls upon leading financiers and merchants in the Eastern cities. In this canvassing he had a good bit of assistance from William B. Ogden, the company's provisional president, but little from the other officials. Poor and Ogden had difficulty in persuading the men they called upon to put funds into such a risky investment as a first trans-continental railroad during a period when profits from existing enterprises—industrial, commercial, and transportation were high and government securities could be had at bargain prices. Nevertheless, by the end of the summer of 1863 they had sold enough shares to permit the formal organization of the company. At the meeting during which this organization was formed Poor was again elected secretary.

Yet within only a few months he had left the company. The reasons for Poor's resignation from the Union Pacific are not clear. Possibly the previous year's work had convinced him of the immense problems which had to be met if the road was to be financed and built before the Civil War came to an end. He may have been disturbed, as were a number of the railroad and financial men most interested in the project, by the aggressive tactics of the new vice-president, Thomas C. Durant. For after Durant took office, nearly all the men Poor knew and trusted, such as Ogden, James Lanier, and J. Edgar Thomson, resigned as directors or refused to take an active part in Union Pacific affairs. In any case, Poor left the Union Pacific before it became involved in *Credit Mobilier* and other somewhat notorious schemes that accompanied its construction.

RAILROAD TO THE PACIFIC

BY HENRY V. POOR, ESQ., EDITOR OF THE "RAILROAD JOURNAL."

IN an age particularly distinguished for its progress in the mechanical sciences, it is natural that an achievement which presents the greatest difficulty, to be followed by the greatest reward that has yet crowned human effort, should possess a paramount interest with a people as utilitarian as our own. It is characteristic of them that they never rest satisfied until they have brought into their service whatever improvements in the economy of life, science has discovered and art wrought out. The pioneer, as he moves forward over the prairies of the West, carries with him the railway,—as necessary in his catalogue of wants as are the axe and the plough. The railway keeps pace with the frontier line of settlement; so that the crop this year, of the frontier farm, in the great march of civilization, has only to be held to the next, to be sent whizzing to the Eastern market in the rail-car, at the speed of thirty miles to the hour!

The progress of railways kept pace with the onward march of our people, till the Mississippi was fairly crossed, when the intermediate territory to the Western ocean, was cleared at a single bound. Upon its shores have been achieved in five years, what have required two hundred to accomplish upon the Atlantic coast. Five years have witnessed the birth and growth, to the features of a mature manhood, of a mighty State upon the Western slope of the continent, which, in addition to more than *fabulous* wealth in its soil,

commands the trade of the Pacific Ocean and the innumerable lands it washes. The focal point of all this commerce is the little island upon which we stand. To reach and enjoy this commerce, we have been unable to bring into use the greatest of all human contrivances—the *railway*. So accustomed have we become to the luxury of its use, that we cannot visit a neighboring village, a few miles distant, without it. It is proof conclusive, that no business nor people worth visiting exist, where no such work is found. If we have, perchance, a country friend, whose *locus* cannot be found in a guide-book, we coolly inform him that when the railroad finds him out, we will try to. What wonder, then, that we are impatient at being cut off from California, from Oregon and Washington Territories, from the Pacific Ocean—its beautiful shores and islands teeming with wealth and busy populations, and ready, if we could reach them, to pour a flood of wealth into the lap of our people. “We must have a railroad to the Pacific,” is the demand of a great nation. How shall we get it? is the problem before us for solution.

The American Geographical Society has not shown itself indifferent to a subject which is exciting such general and profound interest. The object of its organization was, to collect and diffuse “*geographical information*.” It was felt that there was no more appropriate or interesting field for their labors, than that portion of the country through which is to be constructed the great commercial avenue to the Pacific. As the most important step toward accurate geographical ideas, is an intelligible and authentic map of the earth’s surface, one of the first labors of our infant society was to construct the magnificent one which now hangs upon our walls. This map, though unfinished, is by far the most complete of the kind yet executed of the western portion of the territory of the United States, and presents to the eye an amount of information that can be had from the perusal of no other single work. The construction of such a map was a proper initiative for a society like our own. When completed, so as to embrace the whole of the United States, with the territories contiguous, its value, as a means of diffusing correct information, will repay, not only its cost, but all the efforts that have yet been put forth to found and rear the “Geographical Society.”

“A railroad to the Pacific,” is a complex proposition, in which are united numerous elements entirely *dissimilar* in themselves. One of these, and a very important one, is the degree of inclination

of the earth's surface upon the whole, or any part of the line. Another are the obstacles in the way of a *direct* line. A third is the ability of the route to supply to the road, wood and water. A fourth are the expedients to be resorted to for the crossing of rivers and mountains. Considerations like these belong to the *scientific* or engineering department of the road. To another department belongs the duty of providing the ways and the means; a third, the general administration of affairs. In a work like the Pacific railroad, it is not easy to say which of the departments involve the greater difficulties. The engineering, probably, presents the fewest, as, at the present day, nothing is difficult or impossible with *money*. The tunneling of the mountain barrier itself is a mere question of dollars and cents. These supplied, and the engineer has nothing before him but *plain sailing*.

It will be seen, from what I have said, that were I competent, I might occupy a month of your time in discussing the subject of a Pacific railroad, without saying all that was interesting or desirable to be known. A single paper, for an hour's entertainment, were it only to touch upon the various heads embraced in the general proposition, would be valueless for its superficiality. Were it to do more, it would be insupportable from its prolixity. I shall not attempt either, but what will be much more interesting and useful, I propose to offer a few remarks in description of some of the leading characteristics of the country upon the several routes proposed, with such observations as these may naturally suggest, bearing upon the general question. In other words, I propose to read a brief paper the principal object of which will be, to illustrate the subject of a railroad by the use of the map and profiles which you have before you.

The United States, in reference to its geography, may be divided into three grand, well-defined divisions, each possessing characteristics peculiar to itself. They may be termed generally the *Eastern*, *Middle* and *Western* divisions. The first lies between the crest of the great Allegheny ridge and the Atlantic; the second extends from the former to the commencement of the great American desert, at the base of the Rocky Mountains; the third, is, the intermediate territory from the last to the Pacific Ocean.

With the *first* and *second* of these divisions most of us are personally familiar. There are some strong points of resemblance be-

tween them. They have a nearly uniform climate upon similar parallels. They are sufficiently watered from rains, and wooded for agricultural purposes. They are both penetrated by navigable rivers. The surface or topographical features of both are favorable to the easy construction of railroads and ordinary highways. In these particulars, these divisions are in fact so homogenous in their leading aspects, that, contrasted with the third, they may be regarded as one.

The *third* grand division presents a most striking contrast to the two already described. Perhaps its most remarkable characteristic is its great general elevation above the level of the sea, as it is to this elevation that many of its other peculiarities are due. This feature must be thoroughly studied and understood, in order to form a correct idea of the character of the country on the several routes, and the difficulties in the way of the construction of a railroad.

The Mississippi river, in connection with its main affluent, the Missouri, is the dividing line between two great *planes*, one descending to its *left* bank from the summit of the Alleghenies, the other to its right, from the summit of the Rocky Mountains. The uniform and gradual descent of different portions of this great river is very remarkable. From the Gulf of Mexico to the Grand Falls of the Missouri, a distance of 4,000 miles, there is no obstacle to the running of light-draught steamboats at all seasons of the year, when the river is unobstructed by ice. From the mouth of the Ohio to the Gulf, a distance of about 1200 miles, the fall is 275 feet, or nearly $2\frac{3}{8}$ inches to the mile. From the mouth of the Ohio to the Grand Falls of the Missouri, and to the Falls of St. Anthony on the Mississippi, the descent of the two rivers is nearly uniform; that of the Missouri being the greatest by about one inch in the mile. From the Falls of St. Anthony to the junction with the Missouri, the descent is about 495 feet in a distance of 760 miles, or at the rate of $6\frac{1}{2}$ inches to the mile. From the Grand Falls to its mouth, the descent of the Missouri is about 1900 feet in 2600 miles, or at the rate of 7 3-10 inches to the mile. Gov. Stevens estimates the elevation of the river, at the mouth of the Yellow Stone, at 2000 feet above the sea, and at the Grand Fall 2300 feet. As the distance between these points is about 700 miles, the descent of this portion of the river is only about one-half as great as it is near its mouth. We

presume that the first few hundred miles of the Mississippi, immediately below the Falls of St. Anthony, exhibits a similar peculiarity. If so, the upper portions of both rivers show a remarkable fact in the topographical features of this country, and present a striking exception to a general law which seems to be observed in the fall of rivers.

At the Grand Falls of the Missouri, the river descends over a series of cascades 368 feet, in the course of 18 miles. Above the Falls, the inclination of the river does not appear to increase very rapidly, as it is navigable for canoes for five hundred miles, and to a point within 38 miles of the waters of *Clarke's Fork* of the Columbia. This was the route pursued by Lewis and Clark, on their way to the Pacific. At this point their expedition left the river; the elevation does not probably exceed 3,168 feet. From thence to the source, in a distance of about 25 miles, the rise is probably not less than 3000 feet. The uniform inclination of this great river, throughout its whole course, constitutes one of the most remarkable facts in the topographical features of the North American continent.

As before stated, the Mississippi and Missouri rivers mark the boundary of two great *planes*, reaching to them from the summits of the mountain ranges on either side. A striking contrast presented by these planes, is in their *dip* or inclination to the point of their intersection, and their geological structure. While there is a great difference in the elevation of their upper angles, there is still greater difference in the inclination of the rivers which traverse them. The rock forming the Allegheny ranges being chiefly limestone, the rivers that fall from them have cut for themselves deep channels, far below the general surface of the country. They consequently have a gentle flow, with sufficient water to render them navigable for a great portion of the year. The main tributary entering the Mississippi from the East is the Ohio. The descent of this river from Pittsburgh to its mouth, a distance of 975 miles, is 424 feet, or at the rate of $4\frac{32}{100}$ inches to the mile. Following up the Allegheny to *Olean*, in the State of New York, the head of steam navigation, a distance of 250 miles, we find the descent rapidly increasing. The elevation of this point is 1,403 feet above the sea, or 704 feet above Pittsburgh, showing a fall of two feet eight inches to the mile. In fifty miles more we reach the sources

of the river, in the town of Friendship, in this State, 1,678 feet above the sea, and 2,456 miles from the Gulf.

If we examine the Tennessee and Cumberland rivers, which, with the Ohio, drain the greater part of the western slope of the Allegheny range, we find them possessing the same general characteristics as the Ohio. The Tennessee river at Chattanooga, 600 miles from its mouth, is 351 feet above the Ohio, showing a fall of about 7 inches to the mile. Above Chattanooga, the ascent increases rapidly; and upon entering the State of Virginia, about 300 miles from Chattanooga, an elevation of about 1,000 feet is obtained. From the State line to its source, the ascent is about 1,550 feet, in about 125 miles.

The Cumberland, lying within the circle described by the Tennessee, has less descent; the fall from Nashville to its mouth being only 104 feet, in a distance of 240 miles, or at a rate of $5\frac{1}{2}$ inches per mile. The inclination of the head waters of the Cumberland river, does not differ much from those of the Tennessee.

I have been particular to give you the inclination of the rivers draining the western slope of the Alleghenies, or the great *eastern* plane of the Mississippi, that you may better appreciate the consequences that result from the greater slope of the corresponding plane upon its western side. The slight descent of the Ohio, Tennessee, and Cumberland rivers, give them gentle currents and deep channels, peculiarly adapting them as avenues of commerce. On the other hand, in ascending the table-lands which fall towards the *right* bank of the Mississippi and Missouri, we find that the rivers which traverse them have an inclination nearly *ten* times greater than those which enter the former upon the left. For the purposes of this paper, the comparison will be confined to the Arkansas and Platte, as these define *two* routes for the proposed road, and constitute, from their positions, and general directions, appropriate contrasts to the Ohio, Cumberland and Tennessee, and also afford the best illustration of some of the peculiarities of the great western plane they water.

The Arkansas river, entering the Mississippi only about seven hundred miles above its mouth, within what may be termed the great *delta* of the Mississippi, and at an elevation of about 150 feet above the sea, the lower portion of it presents some of the characteristics of its recipient. It has a steamboat navigation to *Fort Smith*, about 500 miles, by the course of the river.

In this distance the descent is probably 250 feet. In longitude 97° west from Greenwich it probably reaches about the same altitude as the *Platte* river at its mouth in longitude 96° . At these respective points the two rivers present similar characteristics, having rapid currents over wide sandy bottoms with low banks, and are entirely unfitted for any commercial purposes. Their respective elevations above the sea are about 1,000 feet. As we ascend the great *plane*, the two rivers maintain nearly the same altitude, showing a remarkable uniformity in the general surface of the country. From the mouth of the *Platte* to Fort Laramie the distance is about 575 miles, and the descent of the river 3,550 feet, showing a rate of fall of about six feet to the mile, or *sixteen* times greater than the *Ohio*. From Fort Laramie, to the South Pass, the descent is at the rate of $10\frac{1}{2}$ feet to the mile, in 185 miles; the crest of the *Rocky Mountains* at this point being 7,490 feet above the sea. The descent of the *head* waters of the *Platte* are nearly five times greater than that of the head waters of the *Ohio*. The rate of the fall of the *Arkansas* very nearly corresponds to that of the *Platte*. From the great Bend of this, in longitude 98 west from Greenwich, to Bent's Fort, which like Fort Laramie, lies at the base of the mountains, the descent of the river is 2,300 feet, in 311 miles, or, at a rate of $7\frac{1}{2}$ feet to the mile. From Bent's Fort to the summit of the *Sangre Dez Christo* Pass, the descent is 4,942 feet in 121 miles, which is at the rate of 40 feet to the mile. Bent's Fort is 3,858 feet above the sea, and the summit of the *Sangre De Christo* Pass, is 8,800 feet according to Capt. Gunnison. The fall of the upper portion of the *Arkansas* is more than twenty times greater than that of the *Allegheny*.

Another great river possessing characteristics very similar to the above, though having a different direction and outlet, is the *Rio del Norte*. All three take their rise in the same great elevated *Plateau*, the *Platte* and *Arkansas* draining its Northern and Eastern, and the *Del Norte* its Southern and South Western slopes. The descent of the upper part of this river is much greater, probably, than either of the former. From San Felipe, in lat. $35^{\circ} 30'$ to a point near the Mexican boundary, the river falls at the rate of four feet per mile, San Felipe is 5,158 feet above the sea, Santa Fe, 6,846, San Felipe is more than 300 miles south from the source of the river in the famous *Cochatoopee* Pass, the water from the southern

slope of which falls into the Del Norte, at the rate of twenty feet to the mile, which is only one-half of the descent of the Huerfano from Bent's Fort to the Sangre De Christo Pass, and which Fremont and Heap describe as a very level route, we have 11,158 feet as the elevation of the Coochatoopee Pass, which is only 76 feet higher than the measurement of Gunnison makes it; viz. 11,082 feet.

It must be borne in mind that the elevations I have given are not those of mountain *summits*, but of the lowest depression between them, such as are followed by the water courses and have been selected on account of their great depression and favorable features as the great routes of travel to the Pacific. The general elevation of the neighboring planes is much greater, while upon all sides of these *passes* tower mountains covered with perpetual snow.

It is easy to see that the inclination of the above rivers entirely unfits them for navigable purposes. They have wide shallow channels with beds but slightly depressed below the general elevation of the country contiguous. In some parts of their course they nearly lose themselves in the sands over which they run. In many places the Del Norte disappears for miles, presenting when it re-appears its full volume of water.

These facts render the country traversed by these rivers inaccessible by the *steamboat*, which has thus far been the pioneer in the westward movement of our people, and constitutes one of the great obstacles to the construction of a Railroad to the Pacific.

The foregoing remarks have been descriptive of the *Eastern* and *Southern* slopes of the great Rocky Mountain Range. Upon reaching the summit of the plane or plateau, from which these mountains rise, we find it extends with very little depression, except where it is intersected by the waters of the Colorado and Columbia, to the Sierra Nevada on the Pacific. The great uniform elevation of the territory embraced within these mountain ranges, is one of the most distinguishing features in the topography of this Continent, and one of the most remarkable of the globe. Nearly every portion of it is thickly studded by ranges of mountains some of which vie in elevation with those that enclose them. If possible, the country is still more barren than that already described. Throughout is the same absence of water and wood. The sands drink up the feeble streams as they descend from the snowy hills. Nothing can be cultivated except by irrigation, which is confined to the narrow bottoms of the

water courses. All else presents the desolation of the desert in all its hideousness. From North to South, this desert extends from an unknown distance below the Mexican boundary nearly to the British Possessions, and probably covers the larger portions of Oregon and Washington territories. Its breadth embraces about 22 degrees of longitude and measures from 900 to 1100 miles. Its general elevation is about 4,500 feet, while throughout its whole extent rise mountains from 10,000 to 15,000 feet high. Within it is the desert of the Great Salt Lake which is elevated 4,200 feet above the sea, and which has a system of mountains and rivers peculiar to itself.

The first grand consequence that results from the great elevation of so large a portion of our continent, is the absence of *rain*. Its height above the sea would largely reduce the quantity, were there no other causes which influence the same result. Either side of the great plateau is flanked by the ranges of the Rocky and Sierra Nevada Mountains, which, intercepting the moisture borne into the interior from the sea, precipitate it upon their lofty summits. This fact explains the cause of the immense masses of snow which collect in the mountain gorges, particularly of the Sierra Nevada. Upon crossing these mountains into the great desert, the snow which accumulates in such immense bodies upon the western slopes, disappears. The same fact is noticed upon the Rocky Mountains, although their influence is not so striking as that of the Sierra Nevada, from the greater elevation of their base, distance from the sea and the drier atmosphere by which they are surrounded. Upon their eastern slopes only a small amount of moisture falls. This is collected upon the lofty mountains, whose heights are sufficient, by the changes of temperature which they cause, to disturb the ordinary equilibrium of the atmosphere, and condense upon their summits the moisture held by it.

This great elevated plateau which embraces the Eastern and Southern slopes of the Rocky Mountains, extending from 250 to 300 miles from their base, presents all the characteristics of a true desert. On the East, the boundary of this desert may be described by a line drawn from the mouth of the Yellow Stone to the great bend of the Arkansas near the point of intersection of the parallel of latitude 38, with longitude 99. The line thence extends very nearly South, inclining a little to the west after entering Texas, and

inclining to the east again on approaching the Rio Grande, and leaving a wide belt of desert country east of the river, to its mouth. Within the limits of this desert is the great Llano Estacado of Texas, an elevated and treeless plain. In latitude 31, 30, Bartlett's Expedition crossed it, and for seventy miles from the Choncho to the Pecos, found no water. In latitude 32, 30, its width is more than double the above. Between the Pecos and the Rio Grande, a distance of about 200 miles, is a high barren plain, portions of it being 5000 feet above the sea.

One of the most remarkable features of portions of this great desert, particularly that of the Great Salt Lake Basin, is the aspect of *newness* which it presents. Rain is the grand disintegrator of the earth's surface. Where it does not fall, the lapse of ages produces no perceptible change in the aspect of nature; consequently portions of the great American Desert present the same appearance they did ten thousand years ago. It seems not to have been disturbed since the warring forces of nature laid down their arms. This warfare would appear to have ended but yesterday. The yawning chasms, the blackened hills, the angular and jagged masses of rock piled up in endless confusion, the heaps of scoria glistening as if it ran from the furnace of yesterday, the vast plains unenlivened by a single specimen of organic or animal life, all bear witness of the external action of those terrific agencies, which now quietly repose in the bowels of the earth. Over the scene of their warfare, through the agency of milder forces, no veil has been thrown. It remains, and always will remain, intelligible alike to the lettered and unlearned, a record of a great crisis in the earth's history.

Throughout this desert wherever running water is found, its sources are always in lofty mountains. These streams constitute the oases of the desert, and are oftentimes separated by *jornadas* or sandy plains without water, all the way from 10 to 100 miles in extent. In the winter, which is the rainy season, these are crossed by mule trains with comparative safety, as portions of them abound in grass. In the summer or dry season they are nearly impassable both for man or beast.

Such is not an overdrawn picture of the physical characteristics of a territory embracing nearly one-half of the breadth of the North American Continent, and over which must be the route of most, if not all, the proposed Railways to the Pacific. I have been particu-

lar not only to describe it with sufficient distinctness for the object I have in view ; but, to contrast its peculiarities with those portions of the country with which we are all familiar. In this manner only, can a correct idea be formed of the magnitude and difficulties in the way of construction of a Pacific Railroad. We are apt to regard the obstacles to such an undertaking the same in *kind*, as those encountered in the construction of a railway east of the Mississippi River. If the Erie Railroad with a line of 500 miles, has cost \$35,000,000, we take it for granted that a Railroad to the Pacific of 2000 miles of line would cost \$140,000,000. Nearly every person in the United States takes the road with which he is the most familiar, as a proper illustration of what the Pacific Railroad is to cost, and solves the problem by multiplying the length and cost of his own into the one proposed to be built.

To this fact, we may ascribe the ready garrulity of all of us upon a subject, of which those who really appreciate its magnitude, approach to say the least, with awe.

The proposition before us involves the construction of a railroad for a distance of nearly 2,000 miles through an uninhabited, and for the greater part, we may say an uninhabitable country, nearly destitute of wood, extensive districts of it destitute of water ; over mountain ranges whose summits are white with eternal snows ; over deserts parched beneath an unclouded sky, and over yawning chasms which the process of disintegration since the volcanic fires were put out, has not yet filled up. How is a sufficient force to be maintained upon such a work for its construction ? And how is the road to be kept in repair and operated after it is built ? How is the locomotive to be supplied with its food, wood and water ? These are some of the questions that are to be discussed and solved ; not the necessity that exists for the work. This requires no demonstration.

For the Pacific Railroad *five* routes are proposed, which may be designated as the Northern or Missouri, the South Pass, the Central or Benton's, the Albuquerque and the Southern. I propose to notice, briefly, the features peculiar to each.

1ST.—THE NORTHERN ROUTE.

The proper base of this route, is the western extremity of Lake Superior. From thence it is prolonged in a generally westerly

direction toward the great bend of the Missouri, the valley of which it follows to the summit of the Rocky Mountains. Crossing these, it falls into the valley of *Clark's Fork* of the *Columbia*, which it follows to its junction with the *Columbia*, and thence along that river to its mouth. This is a route, the entire practicability of which, Gov. Stevens, as we understand, claims to have demonstrated. He entertains a belief that a practicable route may be found from the *Columbia* to Puget Sound by following up the *Yukima* and crossing the Cascade range in the Sno-qual-me Pass, which is about 3,500 feet above the sea.

A superiority claimed for the *Northern* route is the fact that it coincides with a great depression in the surface of the country extending entirely across the continent, as indicated by the course of its three great rivers, the *St. Lawrence*, the *Missouri* and the *Columbia*. The *St. Lawrence* entering the Atlantic Ocean in longitude 56, takes its rise in Lake Superior, in longitude 92, spanning in its course 36 degrees of latitude, or more than one-half of this Continent. The distance from Lake Superior to the Pacific is a few degrees less, or thirty-two degrees. Lake Superior is 690 feet only above the sea, from which it will soon be accessible to large vessels. Here then is a highway, already provided, extending one half the way across the continent and the best possible one for commercial purposes.

From the head of Lake Superior in latitude 47, the line has a generally westerly direction, crossing the head waters of the *Mississippi* at an elevation of about 1,200 feet above the sea, and those of the *Red River* of the North, a short distance below Lake Traverse, at an elevation of about 1,000 feet. From thence it gradually ascends the *coteau* of the prairies of the *Missouri* which are crossed at an elevation, probably, of 2,300 feet. On entering the valley of the *Missouri*, the route adopted by Gov. Stevens avoids the immediate vicinity of the river, keeping upon the elevated prairies for the purpose of obtaining a more direct and better line. In the latitude of the Grand Falls its line is seventy miles north of that point, and 1,300 feet above, or 3,600 feet higher than the ocean. This elevation is gradually increased till the summit of the mountain is reached, some 6,000 feet above the sea. The formation of the mountain ridge is such as to allow of a tunnel of about two miles in length by which the elevation of the road bed

will be reduced to 5,000 feet. From the summit, the descent to the waters of the Columbia is very gentle. At about 100 miles from the summit, the elevation of the waters of the river are about 1,000 feet higher than those of the Missouri, at a corresponding distance; showing the same general fact with regard to the elevation of the country *west* of the Rocky Mountains, already noticed. By taking the Columbia River to its mouth, a favorable route, according to Gov. Stevens, may be had, involving easy grades and no insurmountable obstacle.

The advantages of this route, and in which it is probably superior to all others, are easier grades, a better supply of wood and water, a country upon its line, the agricultural capacities of which are equal to the sustenance of a population sufficient for the maintenance of the road, and the ease with which large bodies of men and material can be thrown upon the work.

The route involves much less rise and fall than any other. Water can probably be found in sufficient abundance upon all parts of its line. Upon the eastern division, abundant supplies of good timber are found on Lake Superior, the Mississippi, and the Red River of the North. From the last named river to the mouth of the Yellow Stone, timber is scantily supplied, and will have to be sought for *off* the main line. One source of supply will be Devils Lake, in latitude 49, longitude 99. The James and Mouse rivers furnish cotton *wood*; a wood, however, poorly adapted for mechanical purposes. On reaching the mouth of the Yellow Stone, pine and red cedar can be obtained from that river. An abundance of good timber is found in the valley of Milk river. On crossing the mountains, the line at once enters a wooded country, which continues on all the water courses to the Pacific. Throughout the whole of this portion of the route, the forests are composed entirely of evergreens.

Another striking advantage which this route possesses over all others, are the greater facilities it presents for cheap and rapid construction. *East* of the Rocky Mountains, the western shore of Lake Superior, the Great Bend, and the Falls of the Missouri, can each be made the base of independent systems of operations. From the two latter, the work of construction can be pushed in either direction. The great advantage resulting from the accessibility of its line, will be better appreciated when we remember

that any required force of men and provisions can be thrown upon it by means of steamboat navigation, which reaches within about seventy miles from the summit of the mountains, upon the meridian of 110°. To reach a corresponding point on any other route, 600 miles at least of desert must first be crossed, over which the only mode of transportation is by the ordinary wagon trains. It is this fact which constitutes the great obstacle to the construction of all but the northern route. The operations of a railroad company are like those of an army, the cost and difficulty of the maintenance of which increase in *inverse* ratio as the scene of its action is removed from its *base*. Upon all other routes the railroad, as it progresses, must constitute the only means of keeping up communication with advanced portions of its line, and of supplying to it all the materials and force employed in construction. To a person familiar with the construction of roads of inconsiderable length, the increased delay and cost arising from the causes named will be readily understood. It is not too much to say, probably, that a given amount of work upon any route proposed, except the Northern, will cost thrice as much, and occupy thrice the time that would be required for an equal amount upon any road east of the Mississippi.

Upon crossing the mountains, the Columbia will also contribute an important service toward the construction of the road, as the river can be used as a means of supplying material and labor.—Governor Stevens estimates that there are only 500 miles upon the whole of this route which cannot be made accessible by navigable water courses.

The objections to this route are, its extreme northern latitude, the great degree of cold which is known to prevail during the winter months, and the fact that it does not look to San Francisco as its Pacific terminus. These are serious objections. There appears, however, to be no sufficient cause for the apprehension which exists, that the snows will constitute any serious obstacle to the running of the trains. It seems to be well settled that only a small depth of snow falls upon the plains of the Upper Missouri. Horses find no difficulty in picking up a comfortable living upon them throughout the winter. They are the winter and summer range of countless herds of Buffalo. Parties left behind by Governor Stevens found no difficulty in crossing the mountains several times during

the winter with horses. As soon as the mountains are crossed, and the waters of the Columbia are reached, the influence of the genial climate of the Pacific begins to be felt.

At the present time, San Francisco is the appropriate terminus of a railroad to the Pacific; but the best route by which it is to be reached, remains to be shown. There is no evidence that the *Northern* is not the best route, even for San Francisco. This important city is, unfortunately, the most difficult of access by railroad, of any point on the Pacific within our possessions. There is no sufficient evidence to show that it can be reached at all with any amount of money that can reasonably be expected to be obtained for such a work.

2D.—THE SOUTH PASS ROUTE.

The next route in order is the "*South Pass.*" This route is now not generally insisted upon. The leading objections to it are the exceeding sterility of the country traversed by it, the almost entire absence of wood, and the immense elevation of a very extensive portion of it, as will be seen by the profile before us. More than 1,000 continuous miles of it are elevated 4,000 feet and upward above the sea. The South Pass summit is 7,490. The Bear Mountain summit 1,000 feet higher. These elevations, in the latitude in which they occur, render this a much colder route, and one more liable to snows, than the Missouri. It would probably be impossible to keep up a communication on this route in the winter season, a fact that must prove fatal to its claims, which, I believe, have ceased to be pressed. It may be proper to state, that this is the route so long and pertinaciously urged by Mr Whitney.

3D.—CENTRAL ROUTE.

The next route is the "*Central,*" or what is more commonly termed *Benton's* route. If the measurements of the height of the different passes upon it are correct, their great elevation must constitute a fatal objection to its adoption. The course of the rivers indicate that this route crosses the highest *table* of the *plateau* already described, it being the source of the Platte, Arkansas, Del Norte, and Colorado rivers, all running in different directions. The indications furnished by the course of the streams are against

the practicability of this route; and I expect to see them confirmed by the results of examinations and surveys. It cannot be that the *lowest* summits are to be found, where rivers running in opposite directions take their rise. The *Coochatopee* Pass cannot be far from the snow line at any portion of the year, and the glowing accounts which describe this valley as the favorite resort of summer, in mid-winter, must have been the creation of a poetic fancy. At 11,000 feet above the sea, in latitude 38°, winter holds almost undisputed sway. Heap tells us in his *Journal*, that the mountains near the head of the Del Norte are called the *Wet Mountains*. He says that rain fell every day in the valleys, which was snow on the mountains, while he was in this vicinity about the middle of June. These facts attest their extreme elevation, and show that immense masses of snow must accumulate in their gorges in the winter season, without a doubt rendering them impassible. It should be borne in mind, also, that Capt. Gunnison makes the *Sangre De Christo* Pass 8,800 feet high, a fact which destroys all probability of its practicability in the winter.

On entering the great desert west of the Rocky Mountains, the indications furnished by the course of the rivers are not favorable to the Central route. As yet, however, this portion of it is a *terra incognita*, about which it is useless to speculate, until more is known. It is proper to state, however, that the claims of this route are strongly supported by Mr. Benton and Col. Fremont—than whom none should be better informed in reference to the country between the Mississippi and the Pacific.

4TH.—ALBUQUERQUE ROUTE.

The next route in order is the Albuquerque route. East of the Del Norte, the line of this route will probably follow the valley of the Canadian, which pursues a favorable direction, with easy grades. After crossing the Del Norte, the route will take the Valley of the Zuni to the Colorado, which it will probably cross near latitude 35°. From thence it can be carried either to San Francisco or San Diego, as the facts shall justify. The merits of this route are, the central position it occupies, its directness, and favorable alignment of its eastern portion. An examination of a map would, we think, indicate this to be the most favorable of all the southern routes, as

far at least as the Del Norte. Beyond that point we do not yet possess sufficient information to speak with confidence. The great obstacles in the way of the construction of it are the lack of timber and water. It would probably suffer no obstruction on account of snows.

5TH.—THE SOUTHERN ROUTE.

The last to be described is the *Southern* route. This may be made a convenient one for all of the lower Mississippi Country, south of and including Memphis. Assuming Shreveport, in latitude $32^{\circ} 20'$, as a point, the line to be pursued will be a very direct one to El Paso upon the parallel of 32° . From thence it will be continued over nearly the same parallel to the Colorado, near the mouth of the Gila, and thence by some route, not yet defined, to San Diego or San Francisco.

The characteristics of this route, do not differ materially from the one last described. East of the Rio Grande its construction will probably be more difficult. About 150 miles of it will be over the *Llano Estacado*, or *Staked Plain*, a high, barren and treeless table, lying between the head waters of the Colorado, Brazos and Trinity rivers of Texas, and the Pecos. The elevation of the line upon this table will be about 3,200 feet. From the Pecos to the Rio Grande, a distance of 200 miles, an equally barren and more elevated region is crossed. The summit between these rivers is 5,000 feet high, which is the same as the proposed tunnel in the *Northern* route.

After leaving the Rio Grande, a still higher summit is probably attained. The general surface of the country, however, is favorable to the San Pedro, and probably to the Gila. At about the parallel of $32^{\circ} 30'$ according to Bartlett, "the Rocky Mountains suddenly drop off about eight miles south of the Copper Mines of New Mexico, (now Fort Webster,) and, with the exception of a few spurs, seem to disappear entirely. Here we emerge into the great plateau or table land, which, with scarcely an interruption, extends more than a thousand miles to the south. The elevation of this plateau varies from 4,000 to 5,000 feet above the level of the sea, and is crossed by no continuous range of mountains for the distance stated. Short, isolated mountains and hills, alone appear at inter-

vals, and these are sometimes separated by fifty or a hundred miles of plain.

The great mountain chain which so abruptly terminates near the Copper Mines as stated, again begins to appear in about the parallel of $31^{\circ} 20'$, a few miles north of the Gaudalupe Pass, through which runs Col. Cook's road. The range is here called the Sierra Madre, and forms an almost unbroken chain through the entire length of Mexico. Within fifty miles to the south there is another pass for mules, but beyond this, none for more than 500 miles.

The Gila is closely hemmed in by elevated mountains for about one-half its length; or to a point about fifty miles below the mouth of the San Pedro river. Some of these mountains extend ten or more miles into the plain, so that it is an absolute impossibility to construct a highway near that river.

The district, or belts of country, which lies between the northern spur of the Sierra Madre, and the southern spurs of the Rocky Mountains, may be safely set down at from 80 to 100 miles in width, and extend entirely across the continent from the Rio Grande to the coast range of mountains on the Pacific. In it are no continuous chains of mountains, such as will present an impassable or even a serious barrier to the construction of a railway. This plain is crossed at intervals of from 15 to 30 miles, with short and isolated ridges of mountains, having an elevation of from 1,000 to 2,000 feet above the plain, and running from north-west to south-east."

The absence of mountains on this route implies a corresponding absence of wood and water. It is probably more deficient in these than any of the routes before described.

The territory upon its line is the most barren of all. Of the desert portion, Mr. Bartlett states that not one-half per cent. is arable land.

Mr. Albert Pike, of Little Rock, Arkansas, in an address before the Southern Convention, recently held at Charleston, speaking from his personal observations stated that the desert portion of this route is not worth a *farthing* an acre. For long distances neither stagnant nor running water is found, and trains cannot cross that portion of it between the Rio Grande and the Colorado without suffering severe privations.

On passing the Colorado we encounter the great California desert

which is about 100 miles in breadth, opposite to Fort Yuma, and increases in width to the North. This desert is destitute of wood, grass and water. Between it and the Colorado is a belt of moving sand, which will probably oppose a serious obstacle to the construction and maintenance of a railway. The great California desert will have to be crossed by the three lower routes, unless a pass can be found to the North of Walker's Pass, which does not seem probable. It is this desert which is one of the most serious obstacles which all the Southern routes will have to encounter.

After the desert is crossed we come to the Southern prolongation of the Sierra Nevada Range, which constitutes another great obstacle to the Southern routes.

No practicable pass through them into the San Joaquin Valley has yet been found. They rise abruptly from the plains on either side not much elevated above the sea, to the height of over 3,500 to 5,000 feet, and involve grades altogether too steep for the operation of a railroad. Examinations still in progress, may discover more favorable passes, or show that the mountains can be tunnelled at a reasonable expense. By crossing directly to San Diego the summit would not be over 3,000 feet. It is problematical whether the proposed road can be carried to San Francisco at reasonable expense *west* of the Coast range.

I have thus given a few of the leading features of the country to be traversed by the routes of the proposed road. I have also, for a better understanding of the subject, contrasted some of the peculiarities of the Western portion of our Continent with the Eastern. I am aware that this paper is a most meagre and unsatisfactory statement of its subject, partly because we have so little accurate information, and from the fact that a work treating in a proper manner all the problems involved in the construction of a railroad, and in elucidating the peculiarities of the country upon its route, would be the labor of a life, and constitute of itself a good sized library. My object has been to indicate some of the leading conditions under which a road upon *any* route will have to be built. When these are thoroughly appreciated, we shall then go the right way to work. Having taken the right direction, every step will carry us forward. Thus far we have been moving without compass or chart, a sport of every wind that blows

I see no way in which either of the proposed roads can be built,

without the efficient support of Government. Previous to a careful examination of the subject, I had supposed that the construction of *one* route, at least, could be secured by liberal grants of lands, and by contracts for mail service. I am now satisfied that, unless the general government will furnish a considerable portion of the cost, say \$50,000 per mile, and upon favorable terms, the construction of a road upon any of the routes is out of the question. The value of all the lands to be given by Mr. Gwinn's Bill would hardly equal the expenses of a preliminary survey. By Mr. McDougal's House Bill, the Northern route would secure a valuable grant, by means of which 500 miles of railroad probably could be built. Upon none of the other routes would a grant of lands be of any considerable value. I should be very sorry to have Government undertake its construction or management. Perhaps our people would be better off without the road. I believe there is no necessity for this. Let Government advance an amount equal to \$50,000 per mile, at an interest of $4\frac{1}{2}$ per cent., and I believe private enterprise would advance the balance required, and guarantee the former from loss, and from the necessity of exercising any interference in the matter. I believe the government should not assume to designate the route to be adopted; but should leave this, and all other questions involved in the construction, entirely to private sagacity and private enterprise. If, with the proposed amount of government aid, *two* roads can be built, let us have *two* routes, a *Northern* and *Southern* one.

If private enterprise will take up only one route, this fact should be viewed as conclusive evidence against the claims of all others. In this way can government shield itself from the charge of partiality, and avoid all entanglement with a work which it is neither competent to construct or manage.

A road upon some of the routes must be built. The wants of commerce, the genius of the age and of our own people demand such a work. *One* road would doubtless prove a fair investment. *One* commercial avenue between two great oceans and between the lands which these oceans surround, *must* pay. As members of the American Geographical Society, or of a still broader community, let us do what lies in our power to aid a work which shall constitute a prouder monument of the progress of our people in the arts of Peace, than nations of the Old World have erected in commemoration of some great achievement in the Arts of Destruction.

THE PROPOSED "PACIFIC RAILROAD"

I PROPOSE, in the paper which I am about to read, to present the subject of the work which is to carry the vast system of railways which now spreads like a net work over all the States east of the Rocky Mountain slope, across that great barrier, and the still more formidable one of the Sierra Nevada, to the Pacific ocean; a work which the necessary complement of our great system of internal improvements, supplying every condition to the full development of the internal and foreign commerce of the country; of the marvelous wealth that now lies hid in the interior of the continent, and to the spread and maintenance of those political ideas and institutions which the North is now making such infinite sacrifices to sustain, and which have been, and must continue to be, the hope of mankind.

The subject of a railroad across the continent naturally suggested itself so soon, almost, as it was seen that this wonderful contrivance to abridge the cost and time of locomotion was a triumphant success. It has been a favorite theme with our people for thirty years; but all discussions and plans in reference to that portion of it now about to be undertaken, were necessarily premature, till the system of railways of the Eastern States had reached the western boundary of the most Western State, a point beyond which individual enterprize, for want of an adequate population could go no further, and where the interposition of Government became both necessary and proper in supplying the means for the work over its own wide domain. Individual enterprize has completed its task. The Missouri River has been reached by a road upon which converge lines starting

from all the great Eastern cities. The continent is more than one-half spanned. The traveller may enter a car at Bangor, Maine, and not leave it till he reaches St. Joseph, Missouri, a distance of 1800 miles—a distance greater than from the Missouri River to the Bay of San Francisco. Numerous other points on the Missouri River will soon be reached, so that the proposed work, almost as soon as it can be commenced will connect directly with prolongations of great lines which will unite it with every important town throughout all the Eastern States.

The moment, therefore, has only just arrived at which the proposed work could be properly commenced. The line itself, and those east of it are necessary to maintain communication with the base of operations. Over them must be carried forward, not only men and food, but nearly all the materials for construction. But what was equally necessary, it has only been within a year or two that the construction of the proposed road could be sustained upon purely financial or commercial considerations. The importance of California was acknowledged, but all between it and the fertile plains of the Mississippi was regarded as little better than a vast desert, incapable of being cultivated, and destitute of mineral wealth or resources to compensate for sterility of soil. But the knowledge we have recently gained in reference to the interior of the continent, has corrected our ideas not only as to the agricultural capabilities of the region to be traversed, but has disclosed to us a metallic wealth which bids fair to throw California entirely into the shade. A cursory examination will convince the most incredulous that the road, when built, cannot fail, with proper management, to become the most productive of any similar one on the continent.

A practical discussion of the proposed work naturally divides itself into three heads :

1st. The physical features of the route, embracing cost of, and time required for construction.

2d. The traffic of the road, and resources of the country to be traversed.

3d. The provision made by Congress for its construction, and the present condition of the enterprise.

I.—THE ROUTE.

The route is made up of four grand divisions, each presenting peculiar and in many respects remarkable characteristics. The first division embraces the great plain extending from the Missouri River to the base of the Rocky Mountains ; the second, the Rocky Mountain range ; the third, the great interior basin of the continent ; and the fourth, the passage of the Sierra Nevada mountains.

The first division, or the great plain, presents an uniform surface, with a slope to the east equalling 6 or 7 feet to the mile. It is from the summit, or crest, of this plain, or plateau, that the Rocky Mountains rise. Its elevation at their eastern base is from 4000 to 4500 feet. The elevation at the probable eastern start-

ing point of the road, on the Missouri River, is 1000 feet. The descent of the streams that traverse this plain is very nearly uniform. Their rapid fall accounts for their unnavigable character. A stream that falls faster than 8 inches to the mile, impinges upon its banks with so much force, that these are washed away; the debris filling up the channel with sand and accumulations of drift wood, so that at an ordinary stage, the water is only a few inches deep. The fall of the lower Mississippi is at the rate of $2\frac{1}{2}$ inches to the mile. That of the upper Mississippi will not exceed 6, while that of the Missouri River equals inches to the mile. No tributaries of the Missouri River are navigable with the exception of the Yellow Stone; the waters of this river with those of the upper Missouri presenting the remarkable phenomenon of a more gentle current than those of the main river, and its tributaries, nearer its mouth.

The rapid slope of the plain to be traversed, while it is eminently favorable to the easy construction and working of the road, forever forbids the idea of a navigable water line, rendering the railway the only improved highway by which the interior of the continent can possibly be reached.

From the Missouri river, consequently, to the base of the Rocky Mountains, every condition exists for the economical construction of a railway. The overland mail coaches make 6 miles an hour over it without any roads but those provided by nature. So gentle and uniform are the slopes, that the plain may be made a great highway in every direction throughout the whole of it. For the first 500 miles, there will be no rock cutting; no grades exceeding probably the angle of roll, or 20 feet to the mile. The soil is open, porous gravel, with the most perfect natural drainage, and the best possible material for a road bed. There will probably be no difficulty whatever in procuring, contiguous to the water courses, an abundance of timber for the superstructure. But few bridges will be necessary. Were it not for the distance of the route from large centres of population, to supply both the labor and material, the road could be built for the distance named cheaper than any ever constructed in the States. As it is, \$20,000 per mile will be ample for the first 600 miles.

The second natural division embraces the range of the Rocky Mountains. But if the line of the Platte River should be adopted, this division will not greatly differ from that already described. The fall of the Platte is uniform for nearly its whole course. The summit of the plateau at the source of this river has an elevation of 7600 feet. The advantage of taking the route of this river consists in the fact that it turns the more lofty ranges, and distributes over a much greater distance the elevation to be overcome. The summit of the plateau has, of itself, all the aspect of a vast plain, and is drained by waters falling in the Gulf of Mexico, the Gulf of California and the Pacific Ocean. Another reason for taking the route of the Platte is its near proximity to the navigable waters of the Columbia River, Steamers are already navigating this river

to Lewistown, 450 miles from its mouth. Boats are now being constructed at this point, to run to Fort Boisee, some three hundred miles further inland. From this point, Capt. Mullan, who has been employed for five years in constructing waggon roads from the head waters of the Columbia to the head waters of the Missouri, is confident that steamboat navigation may be had as far as Fort Hall. If so, when this point is reached, a vast extent of territory, embracing many hundred thousand square miles, many portions of it of great agricultural value, and under-laid with the richest deposits of precious metals, will be immediately opened up to commerce and to the venturesome miner and pioneer.

From the summit of the plateau, assuming the route of the Platte to be adopted, the line falls off by gentle gradations into the valley of the Humboldt, whose direction is almost identical with that most desirable to be pursued by the road. This river loses itself in lakes and marshes lying near the eastern base of Sierra Nevada. The advantage of the route of the Platte and Humboldt over one further south consists in the fact, that for nearly the whole distance it is immediately on the bank of streams furnishing abundant supply of good water, and timber, where this is to be found at all in the region traversed; and also the means of irrigation, which is necessary to the cultivation of crops throughout the whole distance from the 100th meridian to the crest of the Sierra. By following the line of the Platte and Humboldt, a sufficient extent of irrigable land would probably be found to sustain a population fully adequate to the maintenance of the road. Such considerations, certainly do not exist on the route between Great Salt Lake and the eastern slope of the Sierra. The difficulty of obtaining a supply of pure water may render any route but that indicated impracticable. It is well known that the water of a considerable portion of the great interior basin is so filled with alkaline matter, that it cannot be used for steam purposes till freed from its impurities. The water used on the roads in Chili is distilled, either from sea water, or water like that of the great basin, and filled with highly corrosive ingredients. The waters both of the Platte and Humboldt are well adapted to domestic purposes and for generating steam.

In saying what I have, I do not mean to be understood to argue in favor of any particular route; only to show that there is one at least on which there will be no difficulty in obtaining an abundant supply of pure water, one of the prime conditions to the working of a railroad.

The western is by far the most difficult division to construct. These difficulties will be readily appreciated when it is stated, that by the route proposed, an elevation of 7,000 feet is to be overcome in seventy miles. A grade of 100 feet to the mile is not objectionable. Much higher ones are worked without danger or excessive cost. The great difficulty in the present case will be, to distribute the grade so as to make it uniform, or not greatly in excess at any one point on the route named. We have the assurances of the engineers who have carefully examined the

mountain passes that this is entirely practicable. I have no doubt that a practicable route will be, if one has not already been found. Probably no difficulty will be met with in turning the mountains, by diverging to the north, in the same manner that the Rocky Mountains are turned, by following up the valley of the Platte. The western division has the advantage in being near the sea coast and a large population, whence an abundant supply of men and materials for the work can at all times be drawn.

We may assume therefore the existence of a route entirely practicable for a railroad, and for the greater portion of the distance one unusually favorable. It is direct, following for nine-tenths of the distance the valleys of great rivers, furnishing an abundant supply of water, and the means for sustaining a considerable population. There will be no difficulty in obtaining a supply of timber for the superstructure of the road. Coal has been found at several points in Colorado, and also in Utah and Nevada. Nor is it probable that, except upon the summit of the Sierra Nevada, any difficulty will be experienced from snow. This is well settled by the fact that the coaches of the Overland Mail Company were not delayed a single day the past winter upon any portion of their route by snows. Where an ordinary stage coach can be driven in the most unfavorable seasons six miles an hour, little difficulty need be feared by a railroad train. It is only upon the crest of the Sierra Nevada that snows are likely to prove any obstacle, and this difficulty can be avoided by throwing up, for some three or four miles an embankment for the road bed about 10 feet high. A very slight rain fall is one of the most distinguishing phenomenon in the interior of the continent, and even here, the dry, is the winter season.

With the exception, therefore, of the Sierra Nevada, the physical obstacles to the construction of a railroad to the Pacific are much less formidable than those encountered on the line of the Erie railroad. This road, in its day, was a work of ten fold greater magnitude. The whole science of railways was then in its infancy. Since that period this wonderful discovery may be said to have been brought to the highest perfection of which it is capable. In working a Railway we are surrounded by certain limitations of a practical, rather than of a positive or necessary character. The speeds used are not graduated by the capacity of the Engine, but by the results which are secured. The wear and tear both of the track and train is usually estimated to be in ratio to the squares of the speed. It costs nine times as much, consequently, to run a train 30 miles, as it does to run it 10 miles to the hour. Speeds of 60 or 70 miles to the hour, are not maintained, for no other reason than that they cost too much. So the best form of rail, character of superstructure, etc., etc., have long since been fully established by experience; and an Engineer, sitting in his office in New York, has only to be informed of the physical features of the route, and of the cost of labor and of placing materials on the ground, to form a correct estimate of the actual cost of the whole road, involving an expenditure of \$75,000,000. Nothing need be left to conjecture or hazard.

The time required for the construction of the road will depend partly upon the contingencies of finding sources from which a supply of rails can be had for the central portion of the line. Not over one mile of rails can be laid in a day, upon a continuous line. If a progress equal to this could be made from either extremity, the rails could be laid within three years, assuming the distance to be 1,750 miles. But several months must elapse before the commencement can be made in track-laying at either end. But the California portion must for sometime progress slowly. On the other hand, from the starting point on the Missouri, the graduation of the road, if necessary, may proceed at a faster rate than a mile a day; the first six hundred miles can be prepared for the rail in two, as easily as in twenty years. In the interior of the continent the large Mormon population will supply labor ample for the graduation of 400 or 500 miles. Brigham Young, the autocrat of the great basin, has already offered to undertake this portion of the line. He has already signified to the Company his great interest in the enterprize, and offers to undertake the graduation of the interior portion of the continent. There are 100,000 inhabitants in the Great Valley, who produce a much larger amount of food than they consume, and whose aid will be invaluable in the prosecution of this great work.

Assuming, therefore that, if the California section of 150 miles can be constructed in five years, the whole road may be opened within that time, without any loss resulting from a too rapid construction of the work. In fact the more rapid the progress, within certain limits, the greater the economy, as its traffic would increase in much greater ratio than the extent of line opened. If, therefore, ample means are provided, and no doubt need be entertained that they will not be supplied by Government as fast as they can be judiciously expended, and an adequate plan adopted in the outset, the road could as well be constructed in five years as in twenty, even assuming that the work of laying rails will proceed only from the two extremes of the road.

II.—THE PROBABLE TRAFFIC OF THE ROAD.

The developments of the past two years have demonstrated beyond question that every mile of the road, as fast as it can be opened, must be productive. We now know that the whole range of the Rocky and Sierra Nevada Mountains are rich in gold and silver, and that the territories in which these metals are now developed must soon become rich and populous States.

Colorado, which embraces the Eastern Slope of the Rocky Mountains, has already a population of 40,000 souls, and will produce the present year, \$10,000,000 in gold.

The discoveries in Idaho Territory are on a still more extensive scale, and are believed to exceed even California in richness and extent. By the end of the present year this Territory will contain a population of at least 30,000. The mineral wealth of Nevada has already come to be a proverb, and probably exceeds in richness that

of any other region yet discovered on the globe. This territory has a population of 40,000 souls, whose labor is more productive than that of an equal number of people wherever situated. All these Territories offer attractions as great as any that California presented, and are filling up with population as rapidly as that State did at an early period of its history, and will soon rival it in the amount of the precious metals produced.

The total product, the past year, of Gold and Silver in the State and Territories named, including a small amount from Oregon, was estimated by the Secretary of the Interior at \$100,000,000. Estimating the increased production at \$20,000,000 annually, the aggregate amount produced, yearly, by the time the road can be completed, will exceed \$200,000,000. By that time Colorado, Nevada and Idaho will become great and populous States, all whose wants must be supplied over the proposed road. For it must be borne in mind that the miner produces nothing but gold and silver, and also, that for all time the greater part of whatever he consumes must be imported from the food-producing and manufacturing States. With the exception of some portions of the Territories watered by the Columbia River, no crops can be cultivated, except by irrigation, between the 100th meridian and the Eastern boundary of California, and for the whole extent of our Territory from Mexico to the 49th parallel. Yet the labor of the people occupying this territory will be vastly more productive than that of the people of the Eastern States. It will cost but little to send their products to market; they can consequently afford to pay high rates of transportation for what they consume. But this point is so well illustrated by the reference to California, that it is unnecessary to dwell further upon it

In addition to the traffic of the interior Territories, (soon to be States,) of Colorado, Idaho and Nevada, each of which will, as soon as a road can reach them, supply an abundant traffic for its support, we have the overland travel and traffic for the entire Pacific Slope of the Continent. We can form some idea of the magnitude of this travel and commerce from that now existing between the Eastern States and California. But California is only yet in its infancy. Its first beginning dates back only a little more than ten years. The agricultural capacity of this State alone is greater than that of all England. In a few years more the State will double its population and productions. Oregon and Washington Territories will increase in infinitely greater ratio; so that when the road is opened it will serve as the connecting link, as it were, between two great Empires, one commanding the Atlantic and the other the Pacific Ocean.

In discussing the subject of the commercial and financial value of a road spanning a continent, one half of which is fast securing to itself the monopoly of supplying the old world with food, and the other that of the precious metals, and each fronting the most densely inhabited and highly-civilized population of the Eastern continent, the general idea which the mind gets of its importance infinitely

transcends, in clearness and depth of conviction, anything that we gain from detailed statements or estimates of its traffic, or its probable results. A parade of the latter would only belittle the subject from the limitations which they would necessarily impose, and from the inadequate data upon which they would have to be based. The present internal commerce of this country is a creation of Railways. The future is to be equally so. The 25,000 miles of Railroad in the loyal States will transport, the present year, 50,000,000 tons of freight, having a value of \$5,000,000,000, estimating the same at \$100 per ton. These estimates are based upon irrefragible data. Yet nine-tenths of the vast aggregate is the creation of the last decade. Here, in part, is the secret of the financial strength of the country, so new and surprising to ourselves as well as to foreigners.

Ten years more will double the result already achieved. The aggregate incomes of these roads exceed \$150,000,000. The method of the development of this commerce, so regular and stable, would form the most interesting chapter yet written in the history of the physical sciences, and of the progress of society. Yet this career of progress has been only commenced; for science must continue to unfold the secrets of nature in a much greater than in a regular ratio. The Pacific Railroad, consequently, is one of the most potent means of our material developments. Not only has a traffic been already prepared for it in the vast commerce and travel now existing between its two extremes, but its construction will add fifty fold to that already provided—so that the great problem will be, not how to secure a remunerative traffic, but how best to accommodate the vast volume that is certain to be thrown upon the road.

I have not time here to discuss the probable influence of the road upon international commerce. It appears to me, however, that it must work a complete revolution in some of its most important departments. Take the question of foreign exchanges, for example, as far as they relate to the East. No inconsiderable portion of the imports both from India and China have to be paid in gold and silver. The great seat of the production of these metals will, apparently, always continue to be the great mountain ranges which traverse one wide domain from north to south. As the producing nation, with our favorable position, why shall not we become the paymaster for Europe, and completely relieve her from the office she has so long performed for us? I see no reason why we shall not, nor why, having the monopoly for the world in the production of the precious metals and food, we shall not occupy a position of independence to correspond to the means we have at command.

I do not propose here to enlarge upon the importance of the road in military or political point of view. They could not be more obvious from anything that I might say. In case of a foreign war, such a work is indispensable to the defence of the Western half of the continent. It will at the same time place the nation in a position of such complete independence that we could thrive in an isolation, which would be ruinous to our foe. Were the means completed for developing to the utmost every portion of the continent, no nation

could afford to have harmonious relations with us interrupted for a single day. The reason why England has not long ago interfered in our war with the South, is because she could not do without the North.

The road is equally a political necessity. National unity is based upon similarity of tastes and ideas, and these can be maintained between widely separated communities only by supplying the means of constant intercourse. It was such considerations that exerted a most potent influence in Congress and secured the liberal provisions it made for the construction of the road.

III.—THE PROVISIONS MADE BY CONGRESS FOR THE WORK, AND THE PRESENT CONDITION OF THE ENTERPRIZE.

The main line of road authorized by the act of Congress extends from the Western boundary of Iowa to the Eastern boundary of California; the whole lying within the territory of the United States. To aid in its construction five alternate sections of land for ten miles on each side of the road, amounting in all to 6,400 acres per mile, were granted; and, in addition, bonds of the United States having thirty years to run, and bearing six per cent interest, to the amount of \$16,000 per mile for so much of the road as lies on the great plain east of the Rocky Mountains; \$48,000 per mile for 150 miles of the line through the range of mountains, and \$32,000 per mile from the Western base of these mountains to the Eastern base of the Sierra Nevada, subject to a drawback of fifteen per cent. till the road shall be fully completed. The interest on these bonds the Government undertakes to pay. The bonds are to issue *pro rata*, as often as sections of forty miles each of the road shall be completed. All service performed by the Company for the Government is to be credited in liquidation of the bonds. The Company are also to pay over annually to Government, five per cent. of its *net* earnings, and also to reimburse at the end of the thirty years the advances made, with interest, or the road is to be forfeited. In other words the Company, for the thirty years, are to pay directly to Government, only five per cent. of its net earnings, and transport mails, troops &c.; the balance of net earnings may accumulate as a fund for the redemption of the bonds.

As Government does not assume authority to charter railroad companies within any of the States, it extends to the Central Pacific Railroad of California the same amount of bonds granted to the main line—that is \$16,000 per mile for the plain country, and \$48,000 per mile for that portion extending through the Sierra Nevada, estimated at 100 miles. To a road chartered by the State of Kansas, commencing at Kansas City and to extend to the point of intersection with the main line at the 100th meridian, \$16,000 per mile and alternate sections, equal to 6,400, are also granted. A branch is also authorized, from the Missouri River, opposite St. Joseph, to some point of intersection with the main line—the distance of this branch not to exceed 100 miles. The Pacific Railroad Company is

also required to construct a branch from the Missouri River, opposite the mouth of the Sioux River, whenever that point is reached, by a continuous line of Railroad from Milwaukie, or St. Paul. The same general provisions are extended in aid of all the branches that are made in favor of the main line.

Such are the more important provisions made by Government in favor of this great enterprize. They are as favorable as could be desired, and are intended to be ample for the construction of the entire work. There existed and still exists every disposition to do whatever is necessary to aid in its construction. It was thought best, however, to entrust its management to a private company, which was chartered by the act referred to, and some 160 persons, in addition to five appointed by the Secretary of the Interior, were created into a body corporate under the title of the "Union Pacific Railroad Company," the corporators being styled Commissioners of the "Union Pacific Railroad and Telegraph Company." The act empowered the Commissioners named for the State of Illinois, to designate the time of meeting of the Commissioners at Chicago, the place named in the act for meeting for preliminary organization. This meeting was called for the second day of September last, and the Commissioners organized, as the act required, by the choice of William B. Ogden, of Chicago, as President; Henry V. Poor, of New York, as Secretary, and Thomas W. Olcott, of Albany, as Treasurer. The function or duty of the officers so chosen, was to open books of subscription for the two million required to be subscribed to the capital stock of the Company as a condition precedent to an organization by the choice of directors. When the amount named should be subscribed and ten per cent. paid in, then the officers so chosen, were to call a meeting of the stockholders, to organize, by the choice of President, Secretary, and Treasurer, when the functions of the present officers are to cease, and the new organization are to proceed with the construction of the road. Books were opened in pursuance to the requirements of the act, but only a nominal amount was subscribed. That the requisite amount of stock should not have been promptly taken, is not to be wondered at, when we bear in mind the condition of the country, and the unwillingness that people naturally have to go forward in an enterprize till they know with whom they are to be associated, and who are to have the expenditure of their money. But the short time that has elapsed since the organization of the Commissioners, has wonderfully strengthened the project. It has thrown a flood of light upon the interior wealth of the country. No apprehension is longer felt that the North will not emerge triumphantly from the desperate contest in which it is engaged. Every day only serves to make us more and more a nation. The first condition to the undertaking of an enterprize of this kind, is confidence in the stability of our political and social institutions, no day more stronger than at the present moment, and I am happy to say to the audience and through it to the public, that the enterprize is receiving the cordial support of a numerous body of our best, wealthiest and public-spirited citizens, who will bring to the

management of the work abundant means for its vigorous prosecution, an administration, and moral strength which will not only command the entire confidence of the country, but which must result in the speedy construction and wise management of this great work.



Andrew J. Russell

The American Geographical Society's large collection of Pacific Railroad negatives presents, in the words of William D. Pattison, "an organized coverage of the construction and early operation of the railroad and of the country through which it passed." The few examples chosen for this book suggest the great ability of Andrew J. Russell, the leader of the small photographic corps which documented this epic feat of construction. Mr. Russell's wet-plate negatives, made with a camera of his own design, were developed in a wagon-borne darkroom. The captions given are those inscribed on the negatives by Mr. Russell, who obviously was not given to prolix statements.

— WILFRID WEBSTER

The caption for the cover picture is
"Laying last rail — Promontory"



Temporary and permanent bridges, Green River. Citadel Rock in the distance.



Windmill at Laramie.

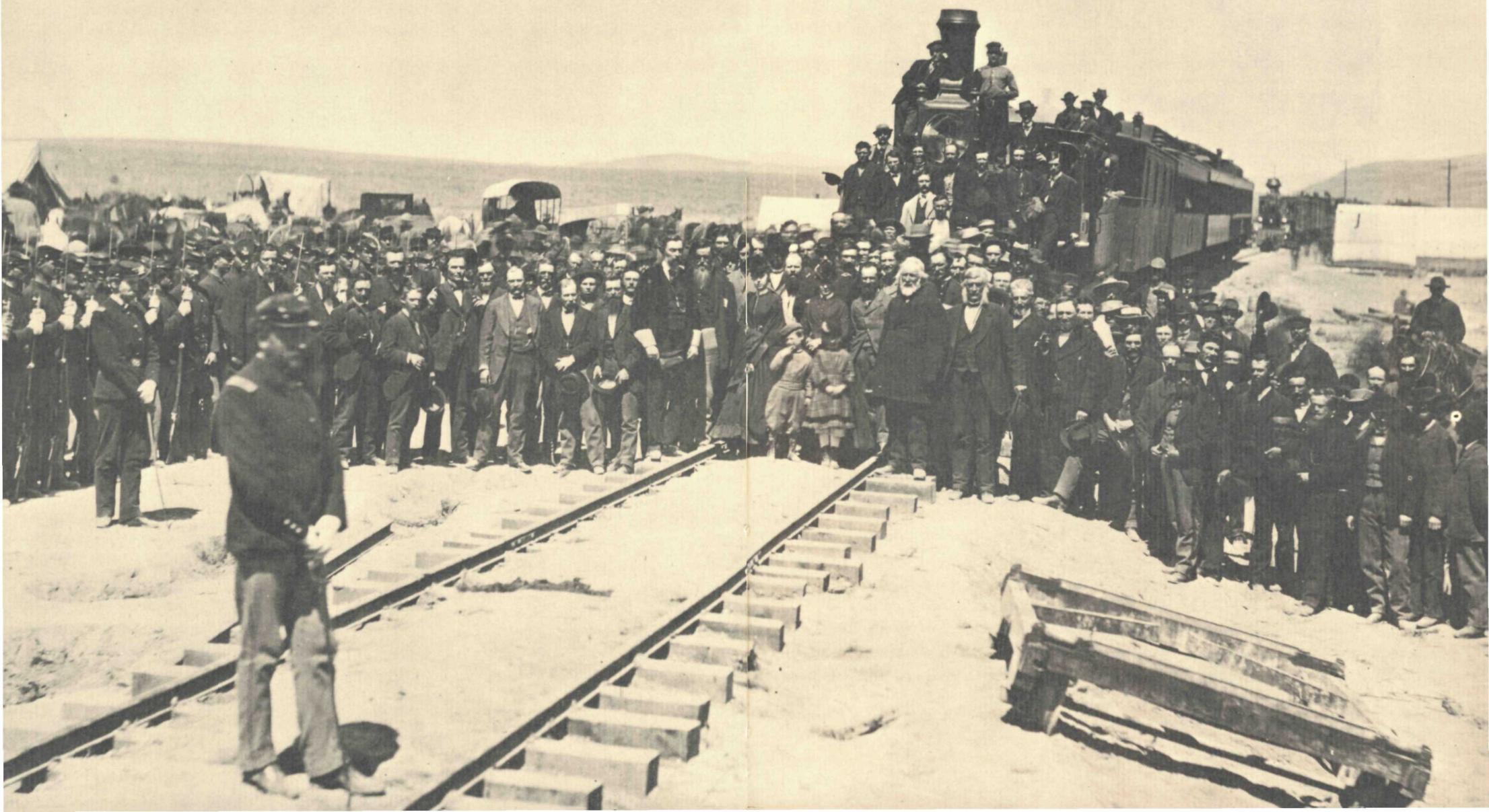
Tunnel No. 3, Weber Canyon.

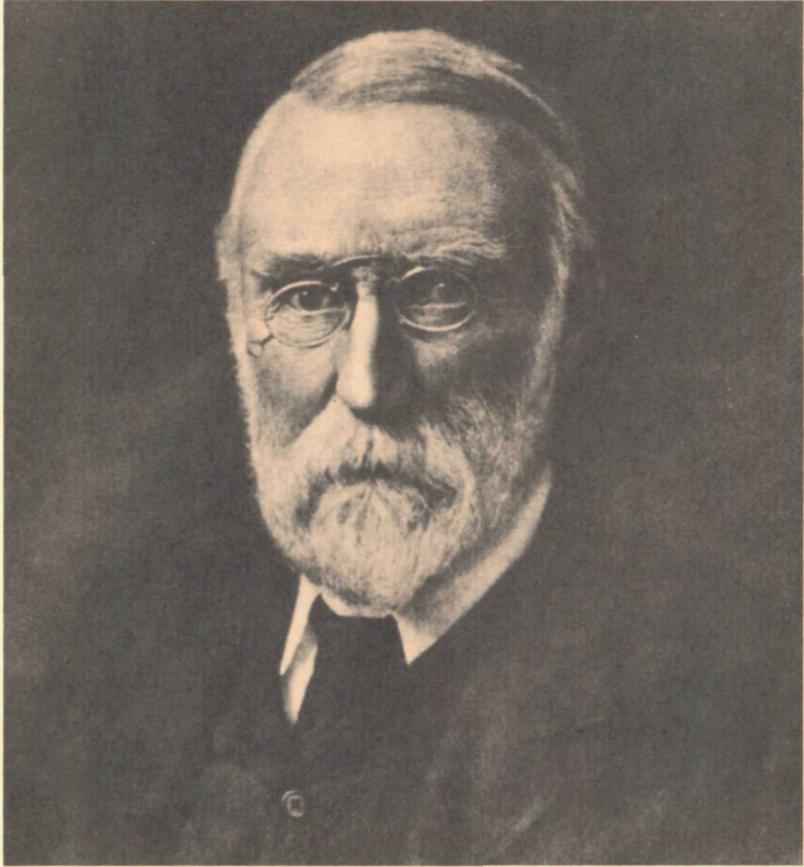


Engineers of U.P.R.R. at the laying of last rail—Promontory.



Officers of U.P. Rail Road at ceremony of laying last rail—Promontory.





James Douglas

DR. JAMES DOUGLAS: AN APPRECIATION

James Douglas was born on the fourth of November, 1837, in the city of Quebec. The son of a kind, gentle, and cultivated mother and a distinguished surgeon, he was destined to become one of the creative personalities who were associated with and contributed much to the development of the mineral resources and the railway transportation systems of the southwestern parts of the United States. His father, Dr. James Douglas, was famous for his skill as a surgeon, his tender and sympathetic care of the mentally disturbed and unbalanced, and for the singular qualities of his probing mind.

James Douglas Jr., or as he was sometimes called in his later years, "The Professor," spent his youth among the dominant, pervasive, and encompassing influences of intellectual and cultural pursuits which were to remain with him and to guide him throughout his life.

To Europe and to many other parts of the world, including a protracted visit to Egypt and the Nile, the young Douglas traveled with his parents. This milieu of travel, inquisitiveness, and scholarship cast the young man in a mold of wide interests and high moral standards which was further reinforced by a few years in the liberal arts disciplines of Edinburgh University and Queens University at Kingston, Ontario, where he received his B.A. degree. To this spectrum of scholastic attainments were added subsequently, during his graduate enrollment at Edinburgh, the exacting curricula of the theological school in which he hoped to become a minister of the Presbyterian faith. The breadth of his curiosity was stretched further by his later studies of medicine, the

achievement of more than a casual acquaintance with the natural sciences, including chemistry and geology, and the arts, more particularly music, which he studied at Bonn on the banks of the Rhine.

He was not ordained as a Presbyterian minister because, though he had successfully met all the requirements, he could not conscientiously subscribe to the Articles of Confession. Accordingly, he was permitted to perform certain functions of the church, but was not allowed to discharge the entire gambit of ministerial duties. His faith in Christianity grew the stronger with the passage of years, while his toleration of the religious dogma of separatism and sectarianism steadily diminished.

In 1860, while at Edinburgh University, he met and married Naomi, the daughter of Captain Walter Douglas, who had been Commodore of the fleet of the Cunard Line and who had sailed the first steamship—the *Unicorn*—into Quebec. She too had as wide a horizon of intellectual interests as her husband. Throughout their long life together, in sickness and in health, in straitened circumstances and in affluence, she was to him an ever-present help, a loving, sympathetic, and cultivated companion.

From his father and his mother, the younger James Douglas inherited many extraordinary qualities of heart and mind. They were, however, combined with large debts incurred by his father. These the son undertook to discharge.

At this point in his life he was well served by his knowledge of the natural sciences and by his financially unsuccessful but otherwise rewarding efforts to convert his father's investment in mining enterprises on the Chaudiere River into profitable operations. To these assets were added his nice command of the English language and his intimate friendship with Dr. T. Sterry Hunt, under whose tutelage his knowledge was vastly extended. Together they invented the Hunt and Douglas process for the leaching of copper ores. The demand for information about, and installation of the process, took the younger Douglas to South America and to several parts of the United States. With this background of knowledge and experience, in 1875 he moved his entire family, including his aging father, to Phoenixville, Pennsylvania, where he became the

manager of the Chemical Copper Company. There he caused to be produced the first electrolytically refined copper on a commercial scale.

It was this difficult and painful move from his parental home which changed the whole course of his life. In search of copper to refine, and as a consultant, he traveled far westward to California, Montana, Arizona, Colorado—indeed, throughout the entire tier of Rocky Mountain states. At the same time he was an associate editor of the Engineering and Mining Press. In this capacity he pleaded editorially for the free exchange of metallurgical knowledge and experience on the grounds that what was given would be more than compensated for by what was received.

For many publications, including the Literary and Historical Society of Quebec, and the American Geographical Society, various technical publications and Canadian and American newspapers, he wrote interestingly on a great variety of subjects.

Transportation fascinated him throughout his life. The frequent journeys which he made in the seventies and early eighties into and across the Rocky Mountains, combined with his meticulous studies of the transcontinental railways and the topographic features they surmounted, provided the background for the following article, first published in 1885 in the *Journal* of the American Geographical Society.

His attainments as an author and his distinction in metallurgy earned for him a wide and eminent reputation. They brought his name to the attention of many men of prominence in the scientific world and stature in the marts of trade. It was this singular reputation for knowledge and unimpeachable integrity which caused Mr. W. E. Dodge and Mr. D. Willis James of Phelps Dodge to establish with him a firm and lasting association. Though badly in need of cash to defray the current cost of his household, he thought it more honorable to risk his time while Mr. Dodge and Mr. James risked their money in the first important mining venture which he recommended. This single decision cemented a close relationship which was to last throughout his lifetime. Each had for the other great esteem and unlimited confidence.

For each, fame and fortune were the worldly rewards. But for Dr. Douglas this single moral decision brought relief from financial duress and required another move with his family in 1882, from Phoenixville to Tarrytown, N.Y., and later, in 1887, to Spuyten Duyvil where he and his wife lived out the full span of their lives together. In the wake of his good fortune came the opportunities to write in his leisure moments and, on his many travels, to lecture before audiences at many universities and learned societies throughout the world. The subjects on which he spoke and wrote were as diverse as they were scholarly.

The foundations on which there was erected the Phelps Dodge of today were firmly and honorably laid by Dr. Douglas. Each mining community of which he was the founder reflects even to the present his high character and his unflinching faith in the essential rectitude of moral behavior.

As a matter of technical law derived from the statutes and court decisions, Phelps Dodge had the right to mine for their own benefit the vast mineral deposits in Bisbee, Arizona which lay beyond the sidelines of their own mining properties. To Dr. Douglas and his sense of fairness, however, these rights, if asserted in the context of the geological conditions prevailing in Bisbee, would have produced a clear miscarriage of justice. Accordingly, with the full consent of his partners, Mr. Dodge and Mr. James, Dr. Douglas caused to be voluntarily waived, throughout the mining area of Bisbee, all the extra-lateral legal rights which were embedded in the apex law and court decisions. In lieu of them, "perpendicular sideline agreements" prevailed throughout the camp. This was one of the great moral decisions of Dr. Douglas' career. For, while it may have directly cost him and his partners millions of dollars, it probably indirectly redounded to their benefit because it saved Bisbee from the widespread corrosion and wholesale corruption of public morals which had so characterized the community of Butte, Montana, and other mining camps.

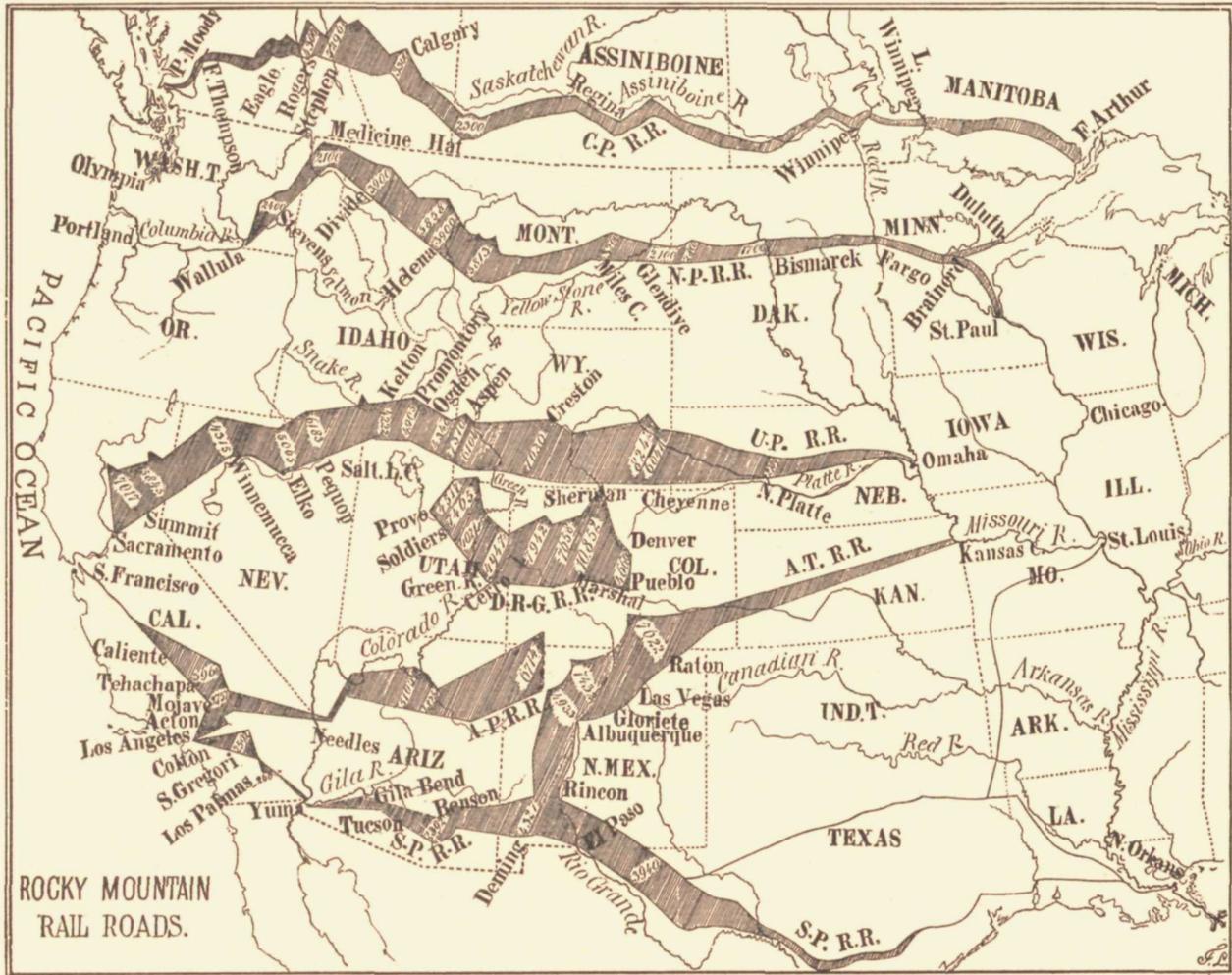
The role which "the Professor" played in discovering and developing the mineral deposits and metallurgical plants of Phelps Dodge in Arizona, New Mexico, and Sonora inevitably

produced conflicts with the railroads which served the area. This conflict, in which the Santa Fe and the Southern Pacific played principal roles, forced Dr. Douglas into the development of a network of rail transport which extended from Tucson, Arizona, throughout southeastern Arizona, northern Sonora, New Mexico and, at one time, as far east as Chicago.

But perhaps as important as may have been the material and physical monuments to Dr. Douglas' vision and enterprise was the encouraging hand which he always extended to young men and the inspiration which he gave them to achieve distinction in their profession. With a mind which remained young and always inquisitive to the last days of his life he was an unfailing help to the younger generation. Hardly a geologist or metallurgist of the younger generation but held him in almost an aura of reverence, both for his kindness and understanding as well as the knowledge which he shared without stint or restraint.

A scientist, a linguist (for he spoke and read English, French, German, and Spanish), a historian (for he wrote several books on the history of Canada and New England and many articles on many subjects including the transcontinental railroads—even as early as 1873 the *Canadian Monthly* published his observations on the proposed Canadian Pacific railroad and its competitors south of the border), a man of medicine (for he personally revived in New York City the Memorial Hospital for the Treatment of Cancer) and a devotee of literature and music, he was as completely cultivated and as well-rounded and spiritually generous a person as modern civilization is capable of producing.

By 1914 the exactions which his many years of long hours and his unflagging industry began to take their toll of his energy. His health at last began to fail. The behavior of the Germans in World War I weighed heavily on his mind and lengthened the shadows which were falling on the closing years of a long and rewarding career. On June 25, 1918, the end came at his home in Spuyten Duyvil overlooking the Hudson River.



HISTORICAL AND GEOGRAPHICAL FEATURES OF THE ROCKY MOUNTAIN RAILROADS

BY

JAMES DOUGLAS.

The Anglo-Saxon race is enterprising, but it cannot lay just claim to being adventurous. Its migratory movements have been made in no spirit of levity, but in very solemn earnest, from strong religious motives, at the bidding of liberty, or under the stress of over-population. Such movements, having their origin in deep racial impulses, have been slow in their inauguration, but irresistible in their progress and permanent in their results. When, therefore, the race occupies territory it rarely abandons it. If it moves less rapidly than more excitable races, its tenacity in the end proves to be in proportion to its inertia.

The progress of the race on this continent is a commentary on these characteristics, and affords material for an interesting chapter in comparative history. Columbus set foot on one of the Antilles in 1492. Within half a century Spain and Portugal sent out over half a hundred discovery expeditions, and explored, with one debatable gap, the whole coast-line of North and South America from Greenland through the Straits of Magellan to the Cedros Islands off the coast of Lower California. Within that period Spain had occupied the principal West Indian Islands, conquered the empire of the Aztecs and the

Incas, crossed our continent from Florida through Texas and Chihuahua to the Pacific, and ascended the Mississippi to the buffalo country. From the Pacific coast of our continent the Spaniards had penetrated through Arizona into New Mexico and Colorado. On the west coast of South America all the country under the sway of the Incas, including a large part of Ecuador, Peru, and Chile, was actually brought under Spanish rule, and Spain and Portugal were already rivals in discovery and occupation on the east coast of the continent. Meanwhile Portugal had doubled the Cape of Good Hope and opened up trade with the East Indies.

That paroxysm of adventurous discovery in the fifteenth and sixteenth centuries hardly touched England. Two expeditions under the Cabots, and another in 1527 to discover the Northwest passage, all comparatively barren of results, were her only recorded contributions; and France played a hardly more conspicuous part, Jacques Cartier's story of his voyages not stimulating the peasantry of France to expose themselves to snow and frost and scurvy, while the unwelcome revelation that his gold was mica and his diamonds quartz crystals removed any temptations which the French nobles may have felt to emulate the methods so successfully pursued by some of their Spanish brethren of recruiting their fortunes by discovery and conquest in the New World. Such a chapter of geographical discovery throws all modern records into the shade.

Compare with it our vaunted discoveries in Africa. It is now a century since Bruce invaded Africa from the north, and forty-four years since Moffat, and thirty years since his son-in-law Livingstone excited the world's interest

by their publications respecting southern Africa. Since then, every section of the mercantile and manufacturing world, and notably the two great branches of the English-speaking race, have had the strongest inducement to cultivate trade with the teeming population of the great lake region, and there has been opened a wide and most fertile field for religious propagandism. Yet of how comparatively small a portion of the Dark Continent have we any knowledge! In fact, the spirit of discovery through sheer love of adventure and of danger, never strong in our matter-of-fact race, seems to be dead except among small sections of the people, influenced by exceptional surroundings, as it can hardly be excited into spasmodic activity by the double motives of gain and religion. Yet when we do explore, we do it to some purpose. The Spaniards explored the continent with the sword in one hand and the cross in the other, but left only trails behind them; we with pick and shovel are obliterating their trails by railroad beds.

In the seventeenth century we find the rôle of discoverers being played by the French. The English have founded a string of colonies along the inhospitable seaboard of New England and the hardly more attractive coast of Maryland, Virginia, and the Carolinas, but their efforts are all directed towards making comfortable homesteads in the wilderness, framing representative systems of municipal government, and securing political rights from the mother country.

A small Dutch colony has planted itself on the Hudson, but home was even dearer to the Dutchman than to his rival the Yankee. Spanish enterprise has been completely stifled by the extortion and grasping colonial policy

of the crown. But the French have occupied Jacques Cartier's discoveries, and French traders hand-in-hand with French missionaries are penetrating the very recesses of the northern continent. Already long before the close of the seventeenth century, and when the English are commencing to open up by sea a trade in furs with Hudson Bay, the French have established missions and trading-posts as far west as the head of Lake Superior, and their *coureurs des bois*, adopting Indian ways and marrying Indian wives, are wandering through the Rocky Mountains and bringing back stories of the sources of the Missouri. The different spirit actuating the different people is well expressed in their varying habit of adaptability. A Virginian Churchman or a New England Puritan populating the West with half-breeds, would be an anomaly we cannot by the utmost stretch of imagination even conceive of.

A century later, at the time of the collapse of the French power in America, we find the English colonies as lethargic as before. The Hudson and Mohawk valleys had brought the English and Dutch of New York into contact with the French, and into competition with the French fur-trade, but the traffic was apparently uncongenial and not pursued with energy. English enterprise here and elsewhere seemed to be sea-bound. It was unable to leap the Alleghanies.

The delusion with regard to the Southwest passage had been dissipated, the Pacific coast to the extreme north explored, and a wide extent of undeveloped continent thus known to be between the two oceans; but what it contained was gathered only vaguely from the stories of the *coureurs des bois*, and such reports of Hudson Bay agents

as escaped from their well-closed archives. Not a single Englishman had described, if he had crossed, the continent from sea to sea.

It seems absolutely incredible that a community of England's hardiest and most intelligent sons should have been content to remain for two centuries hemmed in between the sea and the Alleghanies, uninspired by the slightest curiosity to know what filled the great gap of three thousand miles between their home and the western sea, or to explore, in its northern extensions, the mountain range from which the Spaniards were gathering gold, and freighting their galleons with silver.

Carver in 1766-67-68 explored the head waters of the Mississippi, and described the country north and north-west of the head of Lake Superior, already long and well known to the French. He tells stories of the tribes reported to live to the west of the Shining Mountains, who had gold so plentiful that they made their most common utensils of it. These rumors stimulated him to try to cross the continent. More than one attempt failed before the War of Independence, breaking out, frustrated his and his companion Whitworth's final plans.

Mackenzie, in 1789-93, following the wonderful waterway which, north of the British line, links the waters of Lake Superior with the Pacific by the intervention of but few unimportant portages, traversed the continent from sea to sea, descending to the Pacific by the Peace River.

The American government, to relieve itself from the opprobrium of ignorance, despatched the Lewis and Clark expeditions in 1805. These officers of the U. S. army ascended the Mississippi almost to its source, crossed the divide near the line of the Northern Pacific Railroad,

descended the Clark Fork of the Columbia, and reached the Pacific by the main stream, returning the following year in divided parties so as to explore more territory. Yet so small a portion of the vast region did they describe, and so vague was the information to be derived from other sources, that when Astor equipped his expedition by sea and land in 1812 to secure the fur trade of the Columbia, Mr. Hunt, who led the overland party, was in a *terra incognita* from the time he left the Missouri, which he unfortunately did at a point apparently not far from Yankton, till he reached the mouth of the Columbia. Even such salient geographical features as the course and character of the great rivers were unknown to any member of the party,—hence the cardinal mistake of supposing the Snake River to be the main stream of the Columbia, and of abandoning their land transport-service on a navigable stretch of that river, far above permanently navigable waters.

But while Lewis and Clark were exploring the head waters of the Missouri, another government expedition under Lieutenant Pike first described the whole Mississippi River, previously known only at intervals, from its rise to its junction with the Missouri. He is the same Lieutenant—afterwards Colonel Pike—whose name is so intimately associated with Colorado; for besides giving it to one of Colorado's magnificent mountains, he first, in 1806, ascended the Arkansas, and cutting across the San Luis Park struck the upper waters of the Rio Grande. To him also the world owes its first knowledge of the country drained by the Platte. It was, of course, not till after the purchase of Louisiana, at the commencement of this century, that the government took steps to acquire some

knowledge of the margins of its vast domain. But certain sections have remained so secluded that Custer's military expedition to the Black Hills of Dakota in 1874, only twelve years ago, gave us the first accurate information about that important region.

The old Spanish settlements and towns on the Rio Grande and in southeastern Colorado were linked to California only by pueblos, such as Pueblo Viejo, Tubac, Tucson, and thus a through route from eastern United States settlements to the Pacific by the Santa Fé trail had been always open through Spanish territory. As we have seen, the early Canadian and United States explorers, in looking for roads across the continent, naturally followed the great water-ways of the Missouri and Saskatchewan to the only points on the Pacific, the mouths of the Columbia and the Peace River, which were known as harbors or whither trade relations drew them. Thus the great central zone, where the Rockies attain their grandest development, and are not penetrated or even approached by any navigable rivers, continued to be the dark spot of the continent, utterly abandoned to the red man and trodden by only such daring trappers as Bridger.

As the northern trail was that taken by the earliest emigrants who led the way to Oregon, its advantages as a railroad route were so apparent that as early as 1835 a railroad from the upper Mississippi to the mouth of the Columbia was actually proposed. But the project was not acted on seriously till 1845, when Asa Whitney nearly succeeded in securing from Congress a land grant in aid of the first Northern Pacific, before which more recent grants dwindle into insignificance.

In 1848 the Mormon exodus from Illinois and the oc-

cupation of the promised land of Deseret was completed, and the country was surprised at learning that in the heart of the great American desert a land, flowing with milk and honey, only waited to be cultivated. The government then, in 1849, undertook a survey of the great basin under Captain Stansbury and Lieutenant Gunnison.

In 1848 gold had been discovered in California, in the year of its transfer from Mexico to the United States, and the adventurous spirits of both hemispheres flocked thither. To most, the straightest road was the best. Neither the high walls of the Rockies nor the snowy summits of the Sierra Nevada could deter them. California, not Oregon, henceforth became the objective point of the emigrant, and railroad projects now pointed to California, not to Oregon.

The government in 1852-54 sent out surveying parties in search of railroad routes across the mountains. Their work as embodied in the famous document issued by the war office (Jefferson Davis being Secretary) between 1855-60: "Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean," is as follows:

- (1) A route was surveyed under Governor Stevens along the 47th parallel, which nearly corresponds with that now followed by the Northern Pacific.

- (2) Fremont, Stansbury, and Beckwith surveyed the country between the 41st and 43d parallels, and proposed a route not widely different from that selected for the Union and Central Pacific railroads.

- (3) Captain Gunnison lost his life at the hands of Indians, or Indians and Mormons, while trying to detect a

practicable route through the sea of mountains amidst which the Denver and Rio Grande railroad now runs between Pueblo and the Salt Lake valley.

(4) Lieutenant Whipple surveyed the country now opened by the Atlantic and Pacific railroad.

(5) Lieutenant John Pope described that route now occupied by the Southern Pacific railroad, which the Secretary of War recommended as the most desirable on the score of length, climate, and gradients.

The State of Missouri was the first to charter a trans-continental route, under the name of the Missouri and Pacific R. R. Co. It was to start from St. Louis, and after running southwest, to follow the 36th parallel through the present Indian Territory to Santa Fé, and thence across to the Pacific. The civil war frustrated this scheme, but hastened the accomplishment of another. To build a road through a region within the radius of active war was hazardous. Yet California, isolated from the rest of the States, it was seen, must be brought within rapid reach of the central power. Hence the organization of the Union and Central Pacific Cos., and the liberal assistance tendered them by government to build a road from the Mississippi to the Pacific, far north of the strife then raging. The charters were signed in July, 1862; the first sod of the Central Pacific was turned on the 23d of February, 1863, but work was not commenced on the Union Pacific till the 12th of November, 1865, after the immediate cause for urgency had passed. Fourteen years, or to July 1876, was the limit of time allowed by the charter for the completion of the joint enterprise, but the eastern and western sections met, and the last spike was driven at the station of Promontory, on the 10th of May, 1869.

This station is 1084 miles from Omaha, but only 850 from San Francisco. Yet taking into account the much greater engineering difficulties which beset the Central road in crossing the Sierra Nevada, than those which obstructed the Union road in the Rocky Mountains, as much credit is due to the one as to the other.

Before the Central road had been even commenced at both ends, in 1864, the Northern Pacific R. R. Co. had obtained a charter. Governor Stevens' survey in 1853 of the Northern route had proved its practicability, but this company organized by Mr. Perham sought in vain for financial assistance till Jay Cooke & Co. came to its rescue and effected thereby their own ruin. Construction was commenced in 1870, but owing to many financial vicissitudes the road was completed only in 1883.

Before this the Southern road had been opened from end to end. While the Texas and Pacific Co., chartered in 1872 to construct a road from Fort Worth in Texas to San Diego on the Pacific, was languidly building from the east, and vigorously soliciting government aid, the large stockholders of the Central Pacific were constructing a line with their own resources, along the proposed route of the Texas and Pacific from the California end. And thus before the Texas and Pacific had laid their tracks through the State of Texas, the Southern Pacific had occupied Lower California, Arizona, and New Mexico, and united with the Texas Pacific proper at the end of 1882. Contemporaneously, the Atchison and Topeka, originally a road looking for support to the agricultural resources of Kansas, had crossed the Raton spur of the Rockies, earned the right of adding Santa Fé to its title, and by connecting with the Southern Pacific at Deming,

created another Rocky Mountain railroad. Since then this company has made an independent outlet for itself to the Pacific at San Diego, by the Atlantic and Pacific R. R. and the Colton Branch.

While these broad-gauge roads were seeking for valleys and easy grades by which to cross the mountains, a narrow-gauge road, controlled by officers, and constructed by engineers, with very broad-gauge ideas, the Denver and Rio Grande R. R., was successfully combating difficulties and scaling heights which only lavish expenditure of money, handled by the highest engineering skill, rendered superable. The road was intended to be a link through the valley of the Rio Grande, between the Southern and Central systems, but the Atchison and Topeka forestalled it. The management then divided its energies between fighting the Union Pacific and reaching the most inaccessible regions in Colorado. The marvellous feats which its builders have really accomplished are as wonderful as those the Union Pacific was supposed by popular imagination to have performed.

The year before last (1884) this road finished laying its tracks, from Denver to Salt Lake City, through the very heart of the mountain region.

These are the principal though by no means the only great Rocky Mountain railroad enterprises, undertaken and completed since 1863. But we must pass on from this historical sketch to trace the geographical features of those sections of the continent which they traverse, as exhibited in their profiles.

The Rocky Mountains, including the whole system of mountains and plateaus from the plains as far as the Pacific coast, attain their greatest development in height

and width along the 41st parallel, which nearly coincides with the line of the Union and Central Pacific R. R., and there exhibit with marked prominence all their features, the principal of which are high and steep eastern and western chains, the Rocky Mountains to the east, and the Sierra Nevada to the west, enclosing an elevated plateau corrugated by diagonal minor ranges. To the west of the western rim is a coast valley, itself protected from the sea by a Coast Range. This structure, with such variations as nature loves to indulge in without departing from uniformity of type, is maintained along the west coast of both North and South America, as well as in the structure of other continents.

THE UNION PACIFIC RAILROAD.

The profile of the Union and Central Pacific roads exhibits these features better than that of any other road. The plains rise by a grade, so easy as not to be appreciable to the eye, from 968 feet at the Missouri to 6,038 feet at Cheyenne, or 5,070 feet in 516 miles, the country changing with the decrease in rain-fall from the rich fertility of the Nebraska prairies, to grazing lands, dry and seemingly valueless, but able formerly to support the buffalo and now their tamer successors.

At Cheyenne the Black Hills rise abruptly from the plain, but like all hills looked at from below, the steepness is illusory, for the train scales them to Sherman, a point 8,235 feet above the sea, in thirty-three miles, and then descends into the Laramie plains, whose average elevation is about 6,500 feet. This is in reality the most northerly of the parks, though not generally ranked among them. The plains are well watered by rivulets

which flow north into the North Platte, the main stream of which is separated from the plains by a ridge 7,168 feet, over which the road runs before ascending the Continental Divide, here only 7,100 feet above sea-level, and therefore more than 1,000 feet lower than the summit of the Black Hills at Sherman, and but 500 feet above the average level of the rolling plains which intervene. To the north and south, high mountain ranges break the surface of the plateau, but the profile shows what an easy highway nature offered the railway builders across the great basin on this parallel. It was always the Indian's and trapper's trail, and was in 1852 suggested by Lieut. Gunnison as a feasible railroad route before the official survey.

To the north and northwest can be seen the Seminole Mountains, the Sweetwater Range, and in the far distance the Wood River Mountains; to the south the Elkhead Mountains, and away to the southwest the spurs of the Uintah Range. From the summit there is a down grade to the Green River, for sixty miles of the way along the Bitter Creek, through an utterly desolate region, the cliffs on either side encroaching close on the valley. The sandstones which here accompany the coal that underlies Wyoming to east and west of the Divide, favor the sterility which elevation and drought alone are enough to produce, but add to the scenic effects by weathering into picturesque bluffs. The Green River, one of the great branches of the Colorado, is the first and only large stream which flows into the Pacific, along this parallel, till the Sierra Nevada is passed; the river and lake system of each section of the great basin—the Utah section and the Nevada section—being self-contained.

The Uintah Range, whose axis is nearly east and west, is now the conspicuous feature to the south, its sides covered with forest, and at its base Beaver Creek, which was Bridger's favorite trapping ground for the American Fur Company as far back as 1820. Up the Big Muddy the rail now ascends a spur of the Uintah, crosses it at Aspen at an elevation of 7,835 feet, and descends into the valley of the Bear. This stream, like many others in the Rockies, doubles on its own course. It rises to the south of the track, flows north, outflanking the Wasatch Range, and returns south to discharge, after a course of 230 miles, into the Great Salt Lake, not over sixty miles west of its source. But the railroad builders tunnelled the high jagged range at Wasatch, and carried the track through the wonderful rock scenery of Echo and Weber Cañons, down the steep western slope of the Wasatch to the Salt Lake valley at Ogden.

Five roads radiate from Ogden: the Union Pacific towards the east; the Central Pacific towards the west; the Denver and Rio Grande towards the southeast; the Utah Central runs due south down the valley; and the Utah Northern as a narrow-gauge road due north through the eastern section of Idaho into Montana, where it connects at Garrison, at the western foot of the Rocky Mountains, with the Northern Pacific. But we must travel forward westward over the

CENTRAL PACIFIC.

From Ogden westward the Central Pacific, after crossing from the Utah into the Nevada depression of the Great Basin, descends by easy grades to the eastern foot of the Sierra Nevada, through a region even more desolate

than that traversed by the Union, between naked mountain ranges, over long stretches of rolling sage-brush plains, hardly redeemed from utter sterility by a ribbon of verdure on the banks of the Humboldt River. The railroad follows the valley of this river from Moore Station for a distance of 350 miles till it enters the Humboldt Lake, and flowing thence, loses itself in the sink of the Carson. The profile shows this westerly basin, occupied by the Humboldt and other lakes, to have almost the same level as that of the Great Salt Lake. Into it flow the Humboldt from the east and the Carson and Truckee rivers from the west, all perennial streams carrying large bodies of water; but the thirsty sands and the rapid evaporation from the lakes, which these rivers form, drink up all they contribute. Carson Lake, which, like the Great Salt Lake of Utah, is the residuary recipient of the whole river and lake system of this portion of the Nevada desert, has no outlet. The valley of the Truckee was selected by the railroad engineers as the most feasible route out of the basin. The track, therefore, after traversing from Lovelocks to Wadsworth, about 63 miles, a desert region white with alkali, and full of solfataric activity, bubbling with hot springs, saturated with soda and borax, and productive of brimstone, enters the valley of the Truckee, and following its narrow channel, too barren generally to produce much, even with irrigation, reaches the town of Truckee, a distance of 62 miles, gaining an elevation in that distance of 1,742 feet. At Truckee commences the pull up to the summit, a distance of only 14 miles, in which 1,198 feet of elevation are gained. The scenery of Donner Lake, which the train skirts after leaving Truckee, the piles of mountains rising more than

3,000 feet above the tunnel by which the road cuts through the crest of the Sierra, and on the western side the glimpse of the birth and growth of the streams which dash down through the forests to feed the Sacramento, give this section of the road pre-eminence in beauty; but what between tunnels and 50 miles of snow-sheds, the traveller is kept in a state of constant irritation, as angry as when in New England he expects to get the full view of a beautiful river and enters a covered bridge. Down the western slope of the Sierra the train speeds from the summit at 7,017 feet to Colfax, a descent of 4,595 feet in 51 miles, through the pines into the oak glades and down to the plains. The relief of passing at a bound from the most desolate spot on the continent, the Humboldt Desert, into one of the most fertile of the world's valleys, that of the Sacramento, is intense. The Coast Range does not appear on the profile, because the railroad terminates on the Upper Bay formed by the junction of the Sacramento and the San Joaquin rivers, and this great harbor is carved out of and sheltered by the Coast Range, on whose hills San Francisco itself is built.

THE DENVER AND RIO GRANDE RAILROAD.

The Denver and Rio Grande, as already stated, surpasses all competitors in the feats of engineering its builders have compassed. Each of its branches was, at the time of construction, the most remarkable deed of daring yet attempted, and each successive effort has surpassed its predecessors in boldness of conception and execution.

Our map would be covered to confusion were we to attempt to show each of the Denver and Rio Grande lines.

The first mountain branch was that over the Sangre de Cristo Range by the Veta Pass, thence across the San Luis Park and down the valley of the Rio Grande to near Sante Fé. From this, two feeders diverge to the San Juan and to other as inaccessible mining localities, heretofore deemed difficult of approach by ordinary vehicles.

But what interests us most is the Pueblo and Salt Lake section, which forms one half of another trans-mountain route.

In its career it cuts the Rockies at their highest and wildest, to the west of Pueblo, taking advantage of the Arkansas to reach the water-shed of the continent at Marshall Pass.

The Royal Gorge, in the Grand Cañon of the Arkansas, is the portal which admits the traveller from the plains into the recesses of the mountains where the river receives its life. Above the cañon, the valley widens, and is productive of grasses and of such vegetables as the great altitude permits of coming to maturity. At Salida the branch to Leadville continues up the Arkansas, but the main road ascends the Saguache range to the Continental Divide. This is crossed by Marshall Pass at an elevation of 10,820 feet by grades reaching 220 feet to the mile.

From this great elevation the eye wanders far and near over forest-clad mountains with rounded outline, less startling, perhaps, but more pleasing than the bare sides and jagged profiles of the Eastern and the Sangre de Cristo Ranges, for colors and curves are principal elements of beauty. If they do not elicit wonder, they excite pleasure. Nature when clad in neutral tints is bereft of half her charms. Looking from this vantage ground it would

seem impossible that the railroad could find a path through the network of ranges, the peaks of which tower to north and south and east and west to elevations of 12,000 and 14,000 feet—not one peak, but many. Yet though the road follows river-courses they are not always river valleys, but deep, steep gorges, over whose stony sides the engineers had to be suspended in locating the road, and the miners in dislodging the rocks to gain a footing for the road-bed.

The Tomichi River, the main confluent of the Green, is reached almost at once after the Divide is passed, and where this branch unites with its northern sister to form the Gunnison, is rising the city of Gunnison, the future metropolis of the region, at an altitude of 7,680 feet. Below Gunnison the river cuts through mountain and plateau, creating the Black Cañon of the Gunnison, less gloomy than the Grand Cañon of the Arkansas, and enlivened by a greater variety of rocky outline, for the gorge has been carved out of limestones and sandstones, instead of riven through the old crystalline rocks. It is broader, and is streaked with color derived from the weathering of the rocks, as well as from vegetation. The Gunnison Cañon becomes more rugged below Gold Creek, and rather than follow it the road crosses Squaw Mountain and joins at its western base the Uncompahgre branch of the Gunnison. This it follows to its junction with the main river at the town of Delta, and it still keeps to this highway of nature across the Grand Mesa till it unites with the Grand River at Grand Junction. For 200 miles farther westward the road ascends a series of barren steppes before surmounting the Wasatch and entering the Great Salt Lake Valley.

THE SOUTHERN PACIFIC RAILROAD.

The Southern Pacific is the only United States road whose termini are on the two oceans—the eastern at New Orleans, the western at San Francisco. It runs through the swamps and across the bayous of Louisiana, over the low coast lands of Texas to Houston, and thence traverses from east to west its fertile cotton lands to beyond the old Spanish town of San Antonio, where the land grows less fertile. At 170 miles from San Antonio the road enters the Cañon of the Rio Grande. Through this it is built on benches overhanging the river, and within a stone's throw of the Mexican shore, till it reaches the undulating limestone plateau through which the river has cleft this narrow trough. The train emerges from the cañon at Langtry, which is always guarded by a company of U. S. cavalry, as it is the only ford across the Rio Grande for a distance of 150 miles. On the plateau the scenery differs from that of the plains to the north only in the vegetation which clothes it. We are on the "*Llanos estacados*," the "Staked Plains" of other days. Though no river runs for hundreds of miles through this dreary waste, springs occur, and water in many places is pumped to the surface to supply the cattle and sheep which roam over this scorched wilderness. These, though necessarily few in number to the mile, are an immense multitude in the aggregate. Not a hill breaks the horizon for more than a hundred miles, but the road ascends gradually to Sanderson, where short isolated ranges commence to rise out of the plateau, and the mountain scenery assumes the aspect which it henceforth bears along the line of road, all through New Mexico and Arizona, till the Colorado is passed and the Yuma Desert is entered.

The Rocky Mountains, as we have seen, attain their grandest development in Colorado. In northern New Mexico they still maintain their character as an unbroken Cordillera. But further south it becomes impossible to identify the features which we have seen the continent to possess along the 41st parallel. In western Texas, central New Mexico, and in northern and central Arizona there is a complicated system of short ranges so interlocked as to leave but narrow valleys between; while in the southern portion of these territories similar ranges, with a general northeast and southwest axis, spring from the lofty plateau, whose average elevation is about 4,000 feet, in isolated mountain masses, with great stretches of intervening plain. The Texas Pacific Railroad has crossed the same plains to the north of the Southern Pacific, and entered the same mountain scenery in its straight course from Fort Worth to Sierra Blanca, where, at 91 miles from El Paso on the Rio Grande, it unites with the Southern Pacific. Westward the single railroad winds among these miniature ranges without, as the profile shows, any great variation in grade, and yet by a route so tortuous that long stretches are built to reach points a few miles apart. Bare, treeless mountains before and behind, and on either side, close in every view, while yet the train is gradually crossing a plain of sandy or baked reddish soil, sprinkled with tufts of grass and dotted with soap-weed or yucca, bushes of grease-wood, and groves of mesquite, and in places groups of huge cacti and smaller members of the same grotesque family. Only two rivers, the San Pedro at Benson, and the Santa Cruz at Tucson—the latter generally dry,—are crossed between the Rio Grande and the Colorado, a distance of 550 miles.

The Rocky Mountains have been completely shattered, and their scattered fragments seem to strew the plains. They reunite in the Sierra Madre of Chihuahua, immediately south of the line, recover from their disorder, close in their ranks, and present an unbroken front southward to the Isthmus; but in New Mexico and Arizona they have been completely obliterated as a Cordillera.

The Rio Colorado is crossed at sixty miles above its mouth, where it flows between low sandy banks; for the grand cañon has terminated hundreds of miles above, before the river has turned from its east and west to its north and south course. Before reaching the river the country traversed has become, if possible, more forlorn, and desolation reigns supreme. After the bridge is crossed the Yuma Desert is entered. In traversing it the train runs for hour after hour over plains of sand, thirty miles of which are below sea-level. At all seasons a *mirage* is seen as tempting as any which deludes the African traveller. At places the sandy surface is flat, at others it rises into hillocks like the dunes of Holland, stretches of snow-white alkali vary the color, and what vegetation there is partakes of the sandy tint. The San Bernardino Mountains rise steeply ahead, their slopes as bare and rocky as the mountain ranges between which we have been passing now for over 1,000 miles. They represent the Sierra Nevada mountains which, along this zone of the continent, dwindle, like the Rockies, into insignificance. Further south they continue to assert themselves, but still more feebly, in the peninsula of Lower California, before being lost in the Pacific.

As we ascend the eastern slope of the San Bernardino range the desert merges into arable land, but the sum-

mit of the Gorgonia Pass is so speedily reached that the train seems to leap as if by magic from dreary sterility into the orange groves of Colton and Los Angeles, and the rich verdure of the San Fernando Valley. Here the Coast Range to the west is well defined ; but the coast valley in which this oasis is enshrined, rapidly contracts to the north, and the Sierra Nevada and the Coast Range coalesce into a network of cross ranges through which the selection of a practicable railroad route was no easy task. That selected passes from the head of the valley easterly through the Soledad Pass into the Mojave Desert, the northerly extension of the Yuma Desert, over which we travelled, and then returns through a maze of mountains over the Tehachape Pass northwesterly into the great longitudinal coast valley. In crossing the pass the grades are reduced by making the road describe the figure ∞ round two adjacent isolated hills forming the well known loop.

This is the last engineering feature of note, for the road does not again leave the broad fertile plain of the San Joaquin Valley, closed to the east by the high snow-capped wall of the Sierra Nevada, and to the west by the low wall of the Coast Range.

THE ATCHISON AND TOPEKA RAILROAD.

The Atchison and Topeka started as a prairie road, but through its ramifications it has become the most extensive of all the mountain railroad systems. It has stretched in two directions into Mexico, but with these branches we have not to do.

The mountain section commences at Trinidad, Colorado, where the road has risen upon the plains from 765 feet

at Kansas City, to 5,981 feet at Trinidad, in a distance of 636 miles. We have seen that on the line of the Union Pacific, about 180 miles to the north, from Omaha to Cheyenne, in a distance of 516 miles an elevation of 6,038 feet was attained. At Trinidad, in the midst of a coal-field extending to both sides of the Raton Range, the ascent of this spur of the Rockies commences, and is completed in twelve miles by a tunnel at an elevation of 7,612 feet above the sea. The road now issues on those vast rolling plains which spread over northern New Mexico, Texas, and the Indian Territory, and which feed a thousand rivulets that combine to make the Red and Canadian Rivers, discharging into the Mississippi, and the Pecos, which help to swell the Lower Rio Grande. The road proceeds south with the snowy range of the Sangre de Cristo bounding the view to the west. Behind that flows the Rio Grande, and only beyond that again rises the Continental Divide. Over it the line does not pass, for after crossing the plateau for 175 miles at elevations varying from 5,000 to 6,600 feet, it mounts the Sangre de Cristo Range (here the Glorieta), descends into the valley of the Rio Grande, and follows it for 300 miles to the Mexican frontier town of El Paso.

THE ATLANTIC AND PACIFIC RAILROAD.

But at the old Spanish town of Albuquerque a cross-road branches west, which completes the transcontinental character of the Atchison and Topeka. It is really a section of the St. Louis and Pacific, which is itself a survival of the old Missouri road, of which I spoke in the historical sketch. It runs for all the distance between Albuquerque on the Rio Grande, and the

Colorado River, at the Needles, through the most mountainous section of New Mexico and Arizona, at a very high average altitude. The Continental Divide is passed near Coolidge, at an elevation of 7,306 feet, and the road subsequently runs among heavily pine-clad ranges, past the foot of the San Francisco Mountains, parallel with, and at one spot not more than twenty miles south of, the Grand Cañon of the Colorado, and over the southern extension of the Great Basin. The Colorado River crossed, the road traverses the same dreary waste which in the south we knew as the Yuma Desert, and in the north as the Humboldt Desert, ere it joins the Southern Pacific at Mojave station. The Colton branch completes its direct connection with the Pacific at San Diego.

THE NORTHERN PACIFIC RAILROAD.

We have seen that a Northern Pacific R. R. was the first proposed but almost the last built. As now constructed its eastern terminus is at St. Paul. Thence it sweeps for 275 miles over the rich prairies of Minnesota, then spans the Red River of the north, pursues its way due west still through the most fertile farm-land, crosses the Missouri at Bismarck, and sweeps onward again over deep, rich, black soil till the Bad Lands of Dakota are reached near the Montana boundary; a total distance of about 586 miles from its starting-point. The curve of farming land represents, proceeding northward, that of the rain-fall. Here it reaches the very foot-hills of the Rockies. But throughout the whole mountain zone in this parallel the climate is sufficiently humid in average years to clothe the hill-sides everywhere with nutritive grass, and to fill the valleys with perennial streams,—

hence the enormous cattle-ranching capacity of Montana along its entire width of 800 miles.

The Bad Lands are a relief to the traveller wearied by his long journey over these hundreds of miles of prairie. That these prairies have been laid out into immense farms, and are cultivated by machinery, does not increase their picturesqueness, while it removes from them that human interest with which we invest the homesteads of families who are trying to deserve a living from the earth and to return her kindness by adorning her, in their humble way, with trees and fruits and flowers.

The Bad Lands, which the railway guide-books, jealous of the narrow strip of twenty miles being considered unfit for occupation, ingeniously say were so called by the early French trappers because they were *terres mauvaises à traverser*, not, however, *à cultiver*, owe their origin probably to the lignite which underlies them. Here the outcropping beds have become ignited, and by the heat generated have altered the color and character of the adjacent shales and sandstone, rendering them more liable to erosion by water and wind, the combined influence of which has carved the whole country into most fantastic forms. The great eastern buttresses of the Rocky Mountains now loom into view, but the road remains on the prairies, skirting the Powder Range till it strikes the Yellowstone River at Glendive. To its valley it clings for 340 miles, or as far as Livingstone, where this most important of the northern affluents of the Missouri turns southward to draw its waters from the heart of the Rockies and enhance the beauties of the Yellowstone Park. This valley, where followed by the railroad, is narrow, not averaging three miles in width, and enclosed by bluffs sparsely

clad with pine, which, though low, are still high enough to shut out all but glimpses of the Big Horn and Yellowstone Ranges to the south, which have deflected the river from a straight course between its source and discharge. But each of the rivers which flow into it from the south, fed by the great spurs of the main range, the Powder River, the Tongue, the Rosebud, and the Big Horn, remind us of the last desperate struggle of the dominant nation of the north, the Sioux, against the march of the white man between 1872 and 1877, hastened by the progress of this very railway—a struggle rendered memorable by the daring deeds and untimely end of Custer. In this valley also is a memento of Clark, who, on his return journey in 1806, carved his name on a prominent rock and called it Pompey's Pillar—a name retained for the neighboring railway station.

From St. Paul to Livingstone the grade has been easy and the elevation low. But the road after leaving the Yellowstone commences to climb the Bozeman Range, a spur of the Rocky Mountains. It cuts off the summit by a tunnel, at an elevation of 5,565 feet, and emerges in a wild gorge which it follows along the stream of the Gallatin to the base of the range. Here it enters the birthplace of the Missouri, an amphitheatre of great hills where the Gallatin, the Madison, and the Jefferson unite their waters to form this mighty transcontinental river, which thus springs into existence as a stream of considerable size. We follow its banks for thirty miles, but the Rocky Mountains here bar its further progress westward, and it is prevented from reaching by a straight course its destination in the eastern sea by the confused mass of the Little Belt Mountains, round which it sweeps, through

Clark's Gate of the Rockies, due north, over the falls of the Missouri, and thence as a navigable river eastward. But the road pursues its way westward, crossing the Continental Divide through the Mullan Tunnel, at an elevation of only 5,648 feet.

We are now in the golden land, and almost every valley has been turned over and over in search of the precious dust. The beautiful town of Helena, near the foot of the Divide, stands in a wilderness of boulders, heaps and trenches, and the surface of the valleys near Butte, Banock, and Virginia City, and many another spot, looks like the Bad Lands of Dakota in miniature, tossed out of all shape by the myriads of miners who from 1861, when gold was first discovered in Deer Lodge County, till recently, have extracted from the shallow places of this section of Montana over one hundred millions of dollars. But little is left in this accessible condition, and what little there is will probably remain unmolested, as the Montana miners have ordered away the Chinese.

The Rocky Mountains here, though not of the majestic proportions of the Colorado Range, rise high both north and south of the Mullan Pass. Along this parallel the range seems to have been, as it were, spliced, the Bitter Root Mountains from the south overlapping on the west the main range, which descends from the north. The engineers of the road took advantage of the point where the mass of the range, being thus divided, was reduced in height and a passage was made easy. Tortuously the road ascends the eastern slope of the Continental Divide from Helena at 3,980 feet to the tunnel, affording a magnificent glimpse of the mountains to the south, which enclose the National Park; but the western descent is less

rapid into the valley which carries towards the Columbia the waters of the Deer Lodge Creek, *alias* Hellgate River (the former the name in the farming section of its course, the latter in the mining). The mountains close in,—the Bitter Root Mountains on the left—the main range on the right—till the valley is contracted into a gorge, rendered more sombre by the heavy growth of pines which clothe the rocks; for now that we have crossed the mountains, both plain and hill are forest-clad. Northwest the road runs along the banks of the streams, now swollen into the Clark's Fork of the Columbia, unable to escape westward over the high Bitter Root Range,—bitter indeed to the thousands of penniless prospectors, who three years ago flocked even from the warm southern territories and Mexico to seek for but gather no gold in its snow-clad Cœur d'Alene mines. But where Clark's Fork expands into the beautiful lake of Pend d'Oreille the road finds egress from the mountains and enters the northern extension of the great plateau, which we have traversed in Arizona, and again when crossing the Great Basin on the Union and Central roads. Only here, as the Rocky Mountains point northwest and the Sierra Nevada and their extension, the Cascade Mountains, have a slightly northeasterly trend, the great valley has been crushed in, almost to extinction. It is at this point only 100 miles across, and at less than 100 miles farther to the north it ceases to be well defined. There the Rocky Mountains and the Cascades are built together into the one broad wall, supporting an elevated plateau, against which the waters of the Pacific beat to the furthest limit of the continent.

But though the Great Basin has shrunk to such meagre proportions, its contents have grown in value. We are

far north, but the warm ocean current, flowing from Japan, carries heat and moisture to the coast, and thus the climate of this section of Washington Territory, even east of the Cascades, so assists the fertility of its soil, that the productiveness of this extreme end of the Great Basin almost defies belief. The road cuts diagonally across the basin from the northeast to the southwest, till it strikes the Columbia at Ainsworth.

The gorge which this magnificent river has cut through the Cascades—the representatives of the Sierra Nevada—for a distance of over 200 miles, was taken advantage of by the railroad builders to make their escape to the sea. The only difficult engineering and construction along the road occur in this section, for so precipitously do the banks rise out of the water below to Dalles, that the road-bed had in places to be carved out of the rocky escarpment. The old Oregon trail reaches the Pacific by this route, but the difficulties of road-building were so great that the emigrants never attempted to force a passage by wagon below the Cascades. The railway was the first road of any kind on the banks of this stretch of the lower Columbia.

The Cascades here soar into magnificent proportions, a number of peaks rising above the snow line, as Tacoma, 14,860 feet, and Mt. Hood, 11,025 feet.

Portland is on the Willamette River, a large stream which flows from south to north down the coast valley and joins the Columbia at the bend, where it turns northward to seek an outlet through the Coast Range, which therefore does not of course appear in the profile. Here again we have found all the topographical elements which combine to shape the western half of our continent.

But in the next section, that defined by the surveys of the Canadian Pacific Railway, they are no longer all recognizable.

THE CANADIAN PACIFIC RAILROAD.

The building of the Canadian Pacific was even more a political necessity than the building of the Union. It followed as a consequence on the admission of British Columbia to the Dominion; nay, rather, it was the price offered to British Columbia as an inducement to join the sisterhood of federated provinces. The surveys were commenced in 1871, and work was begun and languidly prosecuted for years, chiefly in the prairie districts, until the present Company was organized in 1880, when construction was pressed with such energy that the track was completed from end to end last autumn. The Company now owns and operates a continuous line from Quebec to the Pacific, and soon expects to control its own track to the Atlantic seaboard. It therefore divides with the Southern Pacific the advantage of operating a perfectly independent road from tide-water on the Atlantic to tide-water on the Pacific.

The line divides itself naturally into three main sections, distinct in their geographical features.

THE FIRST SECTION is that which follows for part of the way the old *voyageur* route from Montreal to Georgian Bay up the Ottawa and up the Mattawan and along Lake Nipissing. Thence it cuts across country to Lake Huron, and skirts the north shore of that lake and of Lake Superior, running between Lakes Superior and Nipigon to Port Arthur and Fort William, on Thunder Bay, Lake Superior.

This whole region, from the Ottawa to Fort William, a tract of 670 miles in length with a width of 300 miles between the lakes and Hudson Bay, covering therefore an area of 200,000 square miles, is to all intents and purposes unexplored. The cold is not more excessive than in the province of Quebec, and the snow-fall is less, but most of the land is unfit for settlement, and there seem to be no such pine forests (unless perhaps in the valley of the Spanish River) as give immediate available value to the valleys of the St. Maurice, the Ottawa, and its eastern tributaries. But it is intersected at distances of about twenty-five miles by large and rapid rivers, along whose valleys, as well as among the labyrinth of lakes which occupy the Height of Land to the north of the Rocky River of Lake Superior, there are extensive areas of land peculiarly fertile in grasses and roots. The azoic and palæozoic rocks which underlie the whole of it are probably as productive of mineral there as elsewhere. At any rate, the Canadian Pacific has opened up a new region on the eastern slope of the continent larger than the whole of New England, New York, Pennsylvania, Virginia, and Ohio, possessing the possibilities of wealth which are attached to every large section of the world's surface.

The real motive, however, for building this section was the military and political necessity of railroad communication between the members of the Confederation, and the speed with which troops were thrown into the northwest last winter justified the wisdom of its construction. Otherwise the Canadian Pacific proper would, like the other Pacific roads, have united with the eastern system of United States roads at or near the northwest end of Lake Superior.

The mention of Lake Nipigon recalls the doings of one of the paladins of northwestern exploration, whose exploits have been strangely overlooked in our day. In 1731 Varrenne de la Verandraye was commandant of the French fort of Lake Nipigon, and heard the same stories of Lake Winnipeg and the country beyond, which the Jesuit Fathers, who ministered at the Mission of the Holy Spirit on Lake Superior, had recorded in their *Relations* half a century before. They fired him with the true enthusiasm of adventure, and, aided by a Canadian commercial house and permission from the French crown, he spent the remainder of his life in exploring the routes of the Northern and Canadian Pacific railroads more than half a century before Lewis and Clark's day. He ascended the Missouri to the Rocky Mountains, but did not cross them. Subsequently he explored the Assiniboine and Saskatchewan, dying almost on the summit of the Rockies in 1749, trying to reach the great Bitter Sea which his Indian guides told him was so near.

This northern zone of the continent though so cold, or rather because so cold, was better known than any toward the south, till we reach the Spanish provinces of Mexico and California. The French had tracked it for furs, and they had established in it missions and trading stations. Contemporaneously the Hudson Bay Company was trafficking with the Indians for their furs at posts along the margin of Hudson Bay.

The two Canadian companies of fur traders consolidated in 1805 into the Northwest Company, which had its head-quarters at Fort William, and drew its furs from every stream of the great prairies and mountains to the very shores of the Pacific; with it the Hudson Bay Com-

pany soon competed for the peltries of the interior. It was to check or share their trade that Astor sent out his expedition to found Astoria on the Columbia River. I have already mentioned Mackenzie's first recorded trip from sea to sea by the Peace River. Fraser, another fur trader, reached the sea by the river which bears his name. But not only had this section of the continent been explored with sledge and canoe by the fur traders, but in its heart, at the confluence of the Red River with the Assiniboine, Lord Selkirk in 1811 had taken steps to found his unhappy colony, recognizing the marvellous fertility of the Manitoba prairies.

His views on many social subjects were as much in advance of his generation as were those of Paterson when he founded his ill-fated Darien Colony. The times were not ripe. Many concurrent circumstances must combine to insure success in great social movements. The movements create the circumstances, and the circumstances again stimulate and propel the movements. But when they originate in some individual effort, no matter how philanthropically noble or theoretically correct, they generally end in disaster. But over their ruins the race advances.

SECOND SECTION.—From Fort William, on Thunder Bay, the road follows the valley of the Kaministiquia and Mattawan for 50 miles till it reaches the low watershed between Lake Superior and Hudson Bay, not far from where this Laurentian ridge, throwing off a spur, deflects its waters, some to the great lakes, some to the Arctic Sea, and some to the Gulf of Mexico. From this point, for 400 miles, till the Red River is approached, the road skirts a chain of these numberless lakes, which here con-

tend with the amphibious land for complete dominion. It is strange in this far northern clime to find vegetation growing so rank as to build up land in the water. Yet the *muskeg* or *sink-hole* of these vast swamps is the outgrowth of such floating islands as surprised the Spaniards in the Lake of Tezcuco and so seriously obstruct the navigation of the Upper Nile. Here they seem to be solid land till the railway builder commences to weight them down with his embankment, when their hollowness becomes apparent. At Barclay the road crossed a *muskeg* beneath which, it was estimated, from the amount of filling required, that there must have been a cavity 200 feet deep. It is unnecessary to point out through what a different climate and country the road passes from that traversed by its southern rivals. The lake region, it is true, commences within the confines of the Northern Pacific. There the lakes offer an agreeable diversion from the land; here the land unfortunately has to be looked for as a diversion from the water. Farther south the land languishes for want of moisture; here it is drowned by a surfeit of water. Happily in THE THIRD SECTION, the prairie division, the balance between land, and water, rain-fall and drought, is better maintained than in any prairie region of the whole west; and were it not for the great cold of the winter months, the fertile belt of the provinces of Manitoba, Assiniboia and Alberta, for 800 miles westward from Winnipeg to Calgary, would claim undisputed pre-eminence in value as farming and grazing land over the regions tributary to any of the southern roads. The remarkable leniency of the climate along the base of the Northern Rockies, even as far north as Lake Athabasca, has always been a matter of sur-

prise, and is more or less a meteorological puzzle. It is, however, a fruitful fact to the Canadian Pacific.

From the rim of Lake Superior to the Red River, near its discharge into Lake Winnipeg, you see from the profile with what a regular down-grade the road follows the water highway. From Winnipeg west it ascends another grade in the valleys of the Assiniboine and Saskatchewan. The country traversed rises by three steppes: that of the Red River, with an elevation of 800 feet, through that of the Qu'Appelle district, whose elevation is 1,600 feet, to the Calgary plateau, with an average altitude of 3,000 feet. At Mosleyville the foot-hills are reached, and at Padmon, 904 miles from Winnipeg, the main range is entered through the Bow River Pass. The ascent thence is easy to the summit, where at 960 miles from Winnipeg, from twin lakes nestling in a valley four miles wide, two streams flow, one to the Atlantic, another to the Pacific. The mountains rise formidably on each side the valley, but the Divide is passed by grades which, except for the upper five miles of the Bow River, where they attain 116 feet to the mile, nowhere exceed 40 feet. Thus the Rocky Mountains are crossed at an elevation of 5,300 feet, through a grassy vale with glacier-clad mountains towering from 5,000 to 6,000 feet on either side, displaying all the sublimity from height and ruggedness of the Colorado mountains, in contrast with forest and verdure more suggestive of Alpine scenery than any thing upon the continent. Down the west-bound stream the track follows the Kicking-Horse River for 47 miles, to the Columbia, here flowing in a broad stream to the northwest. Down the Columbia River it descends, though here this glorious stream, which begins with

a width of a mile, is rather a long, sinuous lake than a river. The Selkirk Range lies coastward, and over it the road now passes by aid of the Beaver River valley at an elevation of 4,300 feet, to again meet and cross the Columbia now flowing southwest. The grades in descending from the main range into the valley where the Columbia is first crossed, in ascending the Selkirk Range, and in again descending by the Ille-Cille-Wact into the Columbia valley to cross it by the second bridge, are for shorter distances 116 feet to the mile. Another range has still to be crossed, the Gold Range, by the Eagle Pass, the three ranges following like waves of decreasing volume. Westward of the Gold Range the road enters the valley of the South Thompson, and skirts the banks of the Shuswap Lake (with one leap over an obstructing promontory) and the South Thompson River to Kamloops, where the North and South Thompson unite and discharge their streams into Kamloops Lake.

From Kamloops the road follows the lake, and the Thompson, and finally the Fraser River through the gorge which it has cut through the Cascade Range. At the mouth of the gorge is Yale, and fifteen miles below is Hope.

Below Yale the waters become tamer, and at Hope they are navigable for river-boats to Westminster, a port of capacity sufficient for the largest ships. Twenty-six miles from Port Hammond, where the railroad leaves the Fraser River, is Vancouver, the terminus of the road.

To identify the geographical features of the section is more or less guesswork. The first and highest range crossed is undoubtedly the Rockies. The last range, not crossed by the railway, but penetrated by the gorge of the Fraser, is generally identified with the southern Coast

Range. It more correctly corresponds, I think, to the prolongation of the Sierra Nevada, the Gulf of Georgia occupying the coast valley, and the Coast Range surviving in the island of Vancouver and the Queen Charlotte group. The intermediate ranges, the Selkirk and the Gold, are probably homologous with the Wasatch and Humboldt, but the crushing together of the whole mountain system has obliterated the great valleys; and the change in climate, resulting in the creation of numerous large and impetuous rivers, has introduced corroding modifying influences not so appreciably felt in the configuration of the southern mountain and valley system. From the base of the Rockies at Cheyenne, on the Union Pacific, to the foot of the Sierra Nevada at Colfax is 885 miles. On the Northern Pacific route, about 500 miles north of the Central Pacific, between corresponding points the mountain system is 590 miles wide, whereas from the base of the Rockies here to what we may assume to be the base of the Sierra chain is only 330 miles.

The scenery of the mountains in this parallel is modified not only by these geographical variations but by the heavy clothing of forest trees. The lumber traffic will be a source of large revenue to the railroad, and one which will grow rapidly in value, for lumber is already becoming scarce on the Pacific. The devastation of the forests of California and Oregon is being carried on with even more ruthless waste than that with which ours are being swept away. It is not in the nature of a Californian to plant for posterity a sapling to replace the tree he cuts down. The thick covering of soil and timber will seriously interfere with and retard prospecting for mineral, but as the arbitrary line between the United States and

the British provinces does not probably limit the deposits of valuable minerals, they will be gradually discovered, and more gradually exhausted than our own. The magnificent scenery is also, not without warrant, counted upon as one source of revenue to the railroad.

CONCLUSIONS.

This rapid sketch may be appropriately supplemented by a table of distances:

UNION & CENTRAL RAILROAD.

San Francisco to Omaha	-	-	-	-	-	1,865	miles.
Omaha to New York	-	-	-	-	-	1,412	"
<hr/>							
San Francisco to New York	-	-	-	-	-	3,277	miles.
New York to Liverpool	-	-	-	-	-	3,065	"
<hr/>							
San Francisco to Liverpool	-	-	-	-	-	6,342	miles.
Yokohama to San Francisco	-	-	-	-	-	4,731	"
<hr/>							
Yokohama to Liverpool	-	-	-	-	-	11,073	miles.

3,277 miles being by rail and 7,796 miles by water.

SOUTHERN PACIFIC RAILROAD.

San Francisco to New Orleans	-	-	-	-	-	2,476	miles.
New Orleans to New York, by sea	-	-	-	-	-	2,519	"
<hr/>							
San Francisco to New York	-	-	-	-	-	4,995	miles.
New Orleans to Liverpool	-	-	-	-	-	4,767	"
<hr/>							
San Francisco to Liverpool	-	-	-	-	-	7,243	miles.
Yokohama to San Francisco	-	-	-	-	-	4,731	"
<hr/>							
Yokohama to Liverpool	-	-	-	-	-	11,974	miles.

2,476 miles being by rail and 9,498 miles by water.

ATCHISON, TOPEKA, & SANTA FÉ.

San Francisco to Kansas City, via Deming	-	-	-	-	-	2,347	miles.
Kansas City to New York	-	-	-	-	-	1,251	"
<hr/>							
San Francisco to New York	-	-	-	-	-	3,598	miles.

ATLANTIC & PACIFIC, AND ATCHISON, TOPEKA, & SANTA FÉ.

San Francisco to Kansas City	-	-	-	-	-	2,099	miles.
Kansas City to New York	-	-	-	-	-	1,251	"
<hr/>							
San Francisco to New York	-	-	-	-	-	3,350	miles.

NORTHERN PACIFIC RAILROAD.

Portland to St. Paul	-	-	-	-	-	1,911	miles.
St. Paul to New York	-	-	-	-	-	1,120	"
<hr/>							
Portland to New York	-	-	-	-	-	3,031	miles.
New York to Liverpool	-	-	-	-	-	3,065	"
<hr/>							
Portland to Liverpool	-	-	-	-	-	6,096	miles.

CANADIAN PACIFIC RAILROAD.

Port Moody to Montreal	-	-	-	-	-	2,868	miles.
Montreal to Liverpool	-	-	-	-	-	2,820	"
<hr/>							
Port Moody to Liverpool	-	-	-	-	-	5,688	miles.
Yokohama to Port Moody	-	-	-	-	-	4,336	"
<hr/>							
Yokohama to Liverpool	-	-	-	-	-	10,024	miles.

You will perceive that the comparison of distances from sea to sea is in favor of the Southern Pacific, but the comparison of profiles slightly favors the Canadian Pacific. This road also stands second on the list as regards distances. These advantages lie, therefore, between the most northerly and the most southerly of the six competitors. Climate is, however, an important factor when we

are judging of the commercial value of each route, and we must remember that the degree of cold and the snow-fall are influenced by altitude even more than by latitude. Hence the Canadian and the Central in this respect stand almost on a par. The road most favorably situated as regards climate is the Southern; but the semi-tropical rains of Southern California and Texas are at times as obstructive to traffic as the snows of the north. No road, therefore, can claim such geographical superiority over its rivals as to give it supreme advantage, and therefore relieve it from the necessity of maintaining a conciliatory attitude towards its competitors and its customers.

A few words as to the products—in men and material—which the building of this vast system of roads, with their aggregate of over 23,000 miles of track, has created. They have to all intents and purposes doubled the available area of this country and Canada, and done it in the short period of twenty years. The sudden opening up of the great West has, therefore, of necessity had momentous consequence upon the character, not only of those who have peopled it, but by reaction upon all classes, even those farthest removed in occupation or locality. Certainly one of the most important influences has been the pernicious effect which the handling of such enormous sums as have been expended on these railroads has had on the political and financial morality of our great centres of government and trade; and the chief wealth of the West having been in the precious metals, a spirit of gambling has been generated both in those who work the mines and those who speculate in their actual or possible production. As the money so rapidly spent on the railroads, and that gathered as rapidly from the

gold and silver mines, together amounts to over three and a half billions of dollars, the effect on society has been notable, and unfortunately not healthy.

It was the discovery of gold in California, and the rush thither to reap a golden harvest without sowing any seed, which stimulated the peopling of the west coast; and it was the Mormon exodus from Illinois, the very same year, and the conversion by these religious fanatics of a tract of country in the very heart of the great desert into an oasis of beauty and fertility, which proved that the mountains would yield other products than the precious metals. Miners and Mormons were, therefore, the elementary material out of which Western life was originally composed.

Gold was the influence that first drew the mobile wave of restless humanity to each section of the mountains in succession, to California in the west, to Colorado in the east, Montana in the north, Arizona in the south. But in searching for gold, silver was discovered, a metal more important to local industry than gold, owing to the greater intricacy of the metallurgical treatment required to win it from its ores. Until 1880, precious-metal mining alone was assisted by the railroad, but in that year Arizona and Montana, being brought within the radius of the world's markets, copper appears as a still more important tribute to the freight-traffic of the West. At present gold, silver, copper, and coal, are its staple mineral products. The output of the last is naturally restricted in quantity by the necessarily limited local demand. The three former have, however, been mined on a scale which the world has not hitherto witnessed, and with that reckless disregard to economy which has characterized all

western enterprises. In a wonderfully short space of time, even when life was insecure, and the Indian was almost the undisputed master of the plains and mountains, an army of prospectors scattered themselves over the whole region, searching in the most inaccessible spots for the precious metals. A region one thousand miles wide by two thousand long, rich in minerals, and utterly virgin ground, was scoured. It is practically bare of soil and unconcealed by forest, and therefore exploration was easy and discovery rapid; but hardly more rapid than the avidity with which the discoveries once made were utilized.

As proof of this, look at the statistics of the precious metals since 1849. Between that date and 1885 the Rocky Mountains yielded about \$2,370,000,000 in gold and silver. The Comstock lode alone produced from 1860 to 1880 \$306,000,000 in gold and silver.

It is worthy of note that on the construction and equipment of the twenty odd thousand miles of railroad in the Rocky Mountain system there were spent \$1,267,000,000, or considerably more than one half the total production of the precious metals.

Despite the relatively small value of copper, its mining and reduction have been pursued with the same wasteful haste. The great enterprises were undertaken when the cost of the metal was much higher than at present. They were planned on a magnificent scale, and when started so frightened the world by their production, that they drove the price down to less than one half. Having been started, they will continue to be run till poverty of ore stops them, as it has stopped the Comstock. I do not mean to say that the wealth of the

West is exhausted, or that great metalliferous deposits will not yet be discovered. But what happened in the early days after the conquest of Mexico is being re-enacted to-day. Within a generation of the conquest nearly all the great mines of Mexico had been discovered, and the cream was rapidly skimmed off them. Yet some of them have been worked almost without interruption, and that profitably, till our day. So, while there is little likelihood that prospecting will be as profitable in the future as it has been in the past, it is as certain that through the beneficial stress of poverty, with which nature sooner or later corrects our extravagance, mining and metallurgy will become more and more of a business and less of a gambling game, to the great gain of both the East and the West.

But the opening of the West has created other fields of industry. The farming land is limited, though everywhere extensive enough to supply the needs of the scanty population ever likely to be dependent on it; but the grazing lands are, comparatively speaking, illimitable. These are being rapidly occupied by cattle only a little less wild than the buffaloes, and by herders as reckless and restless as the miners. There has, therefore, through the influence of their isolated out-door life, passed far from the restraints of society, been rapidly developed a race of herdsmen, prospectors, miners, ranchers, acting under very different impulses from those which kept the New England and Virginia colonists content with their narrow home between the Atlantic and the Alleghanies. These men of the West are the real *coureurs des bois* of our day, and all the acts of Congress would be as powerless to restrain their active independence, as were the *édits et ordonnances* of the

French governors to check the roving habits of their predecessors. Were there a new country to explore, these would be the men to do it. Let there be a great gold discovery in central Africa or New Guinea, and a contingent will start from the Rockies by the earliest train to catch the first steamer, with no baggage but a pair of blankets, and they will reach their goal, be it where it may.

But I must close. After this survey of what has been done in railroad building west of the Missouri since 1862, I think that whether or not you admit the proposition with which I started, that our worthy ancestors were lacking in the spirit of adventure, you will allow that our contemporaries are not deficient in the spirit of enterprise.



THE RAILROAD IN HISTORY

A Bibliographical Introduction

LYNN S. MULLINS

There are times when one must quibble with the comfortable adage that "Ce qui abonde ne vicie pas." An abundance of literature, for example, may be of such a vast dimension that successful penetration may be permitted only to the most persistent of researchers. American railroad history, with its many faceted ramifications for nineteenth-century exploration and mapping, land settlement and use, agrarian and industrial development, commerce, technology, corporate finance, private enterprise, and management, government aid and regulation, labor relations, military logistics, political identification, legal pronouncements, ethics, and innumerable ideologies, surely fits this pattern. Few aspects of American history remain unaffected by the ability of the iron horse to transport people and goods across the land, and the accompanying documentation is a fair match for the subject's apparent boundlessness. Much of relevance is, no doubt, scattered throughout the respective histories of American technological, economic, social, and legal developments. It is to the nucleus of the literature, however, made up of reports of railroad companies and regulatory commissions, congressional and state documents, company histories, biographies of prominent railroad men, and the like, that this essay is directed. This literature, even when so limited, is still of a superabundant nature, and some guidance is clearly called for. To this end the more important bibliographies and general guides to historical studies, government documents, collections of statistics, periodicals, maps, photographs, and archival materials will be pointed out. Whenever appropriate, reference will be made to those bibliographies and other finding aids that embrace fields broader than railroad and transportation history. No attempt, needless to say, will be made at comprehensiveness.

The best guide to the very early literature is Thomas Richard Thomson's *Check List of Publications on American Railroads before 1841* (New York, New York Public Library, 1942), an annotated list compiled with the assistance of a number of libraries with substantial holdings on railroad history. Far more than a preliminary "check list," this chronologically arranged bibliography contains references to an

unusually broad spectrum of printed materials (books, pamphlets, state and federal documents, maps and profiles, travel guides, gazetteers, broadsides, etc.). At the time railroad projects were generally known as "internal improvements" or public works, and anyone interested in this period should bear in mind that there will be few references under "railroads." In 1892 Timothy Hopkins, Treasurer of the Southern Pacific Company, presented his private collection of railroading to Stanford University and founded what was to become one of the most important railroad libraries in the country, the Hopkins Transportation Library. Three years later the Library achieved international renown with the publication of Frederick J. Teggart's *Catalogue of the Hopkins Railway Library* (Palo Alto, Calif., Leland Stanford Junior University, Library, 1895), a list of some 9200 books and pamphlets. This early catalogue is still a valuable source of references to the legion of commission reports, guides, maps, and other materials on individual railroad lines in America and other parts of the world. The foremost American library is the Library of the Bureau of Railway Economics, in Washington, founded in 1910 to serve the industry and all students of transportation, and now a subdivision of the Association of American Railroads. The preparation of bibliographies on railroad material has been a significant part of the Library's activities, dating from the Bureau's classic *Railway Economics: A Collective Catalogue of Books in Fourteen American Libraries* (Chicago, University of Chicago Press, 1912) to the present. Locations of libraries owning the books listed in this classified bibliography are given as an added convenience. An idea of the amount and variety of the bibliographies (the majority in mimeographed format) compiled by the Library since this early work can be obtained from the Bureau's *Railroad Bibliographies: A Trial Check-List* (Washington, 1938). Bibliographies on persons, topics, regions, and roads abound. A second section in this bibliography of bibliographies contains citations to reference lists compiled by other organizations and researchers.

Representative of the Bureau's bibliographical work on specific railroads is *A List of References to Literature Relating*

to the *Union Pacific System* (Washington, 1922), a chronologically arranged compilation that includes citizens' memoranda to Congress advocating particular plans for a road to the Pacific, mid-century explorations and surveys, reports of construction engineers, and, upon completion, transcontinental excursion guides. *Illinois Central Railroad Company: A Centennial Bibliography, 1851-1951* (Washington, 1950) serves as a sample title of a recent bibliography compiled by Helen R. Richardson for the Bureau's Library. Those persons interested in the major role played by this company in the settlement and industrialization of the Midwest would do well to consult this volume. Among the Bureau's topical bibliographies is *Railroads in Defense and War* (Washington, 1953), also assembled by Helen Richardson. For present purposes the section on the Civil War, with its references on military and Confederate railroads, transportation of troops and supplies, and the postwar settlement of accounts between Congress and the railroads, is of special value. The Bureau's *Public Relations of the Railroad Industry in the United States: A Bibliography, 1808-1955* (Washington, 1956) provides a surprisingly large number of references (in the section covering 1808-1869) that range from the "Documents Tending to Prove the Superior Advantages of Rail-Ways and Steam-Carriages Over Canal Navigation" (1812) to the ephemeral promotional literature that enthusiastically proclaimed the popularity of rail travel with farmers.

Evident from these samples of the bibliographies issued by the Bureau is a marked concern with railroad history. In 1940 the Association of American Railroads prepared a guide to *Railroad Histories and Sources of Historical Information about Railroads* (Washington, 1940). Listed in this pamphlet are the principal general histories of the nineteenth century, such as Henry S. Tanner's *A Description of the Canals and Rail Roads of the United States* (New York, Tanner & Disturnell, 1840), Henry Varnum Poor's *History of the Railroads and Canals of the United States of America*, Vol. 1 (New York, Schultz, 1860), Henry M. Flint's *The Railroads of the United States: Their History and Statistics* (Philadelphia, Potter, 1868), and John Luther Ringwalt's *Develop-*

ment of Transportation Systems in the United States (Philadelphia, Railway World Office, 1888). Selected histories of individual railroads, biographical material on leading figures, statistical summaries, and early periodicals are also itemized in this guide.

Many of the important textual surveys of the history of transportation contain extensive bibliographical references that should not be overlooked as source material. A bibliography of some fifty pages is appended to Caroline E. MacGill's comprehensive *History of Transportation in the United States before 1860* (Washington, Carnegie Institution of Washington, 1917; Carnegie Institution of Washington, *Publication No. 215C*), prepared under the editorship of Balthasar Henry Meyer. Oscar Osburn Winther's *The Transportation Frontier: Trans-Mississippi West, 1865-1890* (New York, Holt, Rinehart and Winston, 1964) includes helpful comments on the numerous works noted in his concluding bibliographical essay. Since the book and periodical literature on subjects such as land grants is vast, it is valuable to have a well-read author (Oscar Winther) single out the works he found most useful. These date from John B. Sanborn's classic *Congressional Grants of Land in Aid of Railways* (Madison, Wis., 1899; *University of Wisconsin Bulletin*, No. 30; *Economics and Political Science and History Series*, Vol. 2, No. 3) to the more recent publications by David Maldwyn Ellis, Paul W. Gates, Robert S. Henry, John B. Rae, and the like. Winther also cites a large number of articles on the construction and development of roads in particular localities, most of which appear in the various historical journals (*Arkansas Historical Quarterly*, *Iowa Journal of History*, *Kansas Historical Quarterly*, *Minnesota History*, *Mississippi Valley Historical Review*, *Missouri Historical Review*, *Pacific Historical Review*, *Pacific Northwest Quarterly*, *Palimpsest*, *Southwestern Historical Quarterly*, etc.). Early travel observations and reminiscences of persons who made extensive train journeys constitute another genre of literature utilized and commented on by Professor Winther. In 1961 he displayed his considerable bibliographical skills in the compilation of *A Classified Bibliography of the Periodical Literature of the Trans-Mississippi*

West, 1811-1957 (Bloomington, Ind., Indiana University Press, 1961; *Indiana University Social Science Series No. 19*), a veritable reservoir of references on railroad history.

Another general bibliography whose scope is broader than transportation history is Douglas R. McManis' *Historical Geography of the United States: A Bibliography, Excluding Alaska and Hawaii* (Ypsilanti, Mich., Eastern Michigan University, Division of Field Services, 1965). The standard guides to American historical literature, such as Henry P. Beers's *Bibliographies in American History* (New York, H. W. Wilson, 1942), the *Harvard Guide to American History* (Cambridge, Mass., Harvard University Press, 1954) and *Writings on American History* (issued as Volume 2 of the *Annual Report* of the American Historical Association), all contain countless references on railroads.

Research in the neighboring fields of the history of technology and business enterprise will also yield pertinent information. Eugene S. Ferguson's recent *Bibliography of the History of Technology* (Cambridge, Mass., Society for the History of Technology and the M.I.T. Press, 1968; *S.H.O.T. Monograph Series*, Vol. 5) includes numerous studies on railroads, with special emphasis on those dealing with locomotives, locomotive builders, gauges, rails, and tracks. Works of a more general nature, such as Richard C. Overton's *Burlington Route: A History of the Burlington Lines* (New York, Knopf, 1965), are also noted. The quarterly journal, *Technology and Culture*, should also be scanned for its pertinent historical articles, book reviews, and bibliographical compilations. Other useful studies can be found in Henrietta M. Larson's *Guide to Business History* (Cambridge, Mass., Harvard University Press, 1948; *Harvard Studies in Business History*, No. 12). Three sections in this critically annotated guide are of special relevance: industrial capitalists, transportation companies, and transportation industries. Emphasis here is on corporate history and key personnel in administration and management. Professor Larson's earlier interest in promoting research on the history of railroad administration was manifested in her "Some Unexplored Fields in American Railroad History" (*Bulletin of the Business Historical Society*,

Vol. 16, No. 4, October, 1942, p. 69-79). *Studies in Enterprise: A Selected Bibliography of American and Canadian Company Histories and Biographies of Businessmen*, by Lorna M. Daniells (Boston, Harvard University, Graduate School of Business Administration, 1957), serves to some extent as a supplement to the *Guide to Business History*. A good-sized section on railroad company history and biography of key personnel is included. Supplements appeared annually through 1964 (covering the year 1963) in the *Business History Review* and will presumably be reinstated in the near future. One of the best surveys of the ideas and attitudes of the men who built and controlled railroad properties toward business administration, management, labor, competition, government relations, and society in general is Thomas C. Cochran's *Railroad Leaders, 1845-1890: The Business Mind in Action* (New York, Russell & Russell, 1953). This scholarly study is based on an examination of the business correspondence of some sixty-one executives.

Railroads have always maintained a close, if not at times intimate, connection with the federal and state governments. The various phases of the beginnings of this long-term relationship are reflected in the superabundance of government documents that was released during the nineteenth century. The best introduction to this material is the review article, "Federal Documents Relating to Railroads: Some Highlights" (*Bulletin No. 44*, Railway and Locomotive Historical Society, 1937), contributed by Elizabeth O. Cullen, former reference librarian at the Bureau of Railway Economics Library. The very early "Gallatin Report" on internal improvements (1808) is remembered for its postscript on the dismal future of rail travel in the United States. During the 1830's a selection of documents that illustrate the government's growing interest in exploring the possibilities of the steam engine for land transport (reports on the comparative merits of railroads and canals, surveys of rail routes from the Atlantic to the Mississippi, studies of the steam engines in use and the quantity of iron imported into the country for rail purposes, etc.) are singled out and commented on in this excellent paper. By the next ten years many communities

and state legislatures were preparing memorials requesting land grants for railroad construction and extension, and in 1845 Asa Whitney, inveterate promoter of a transcontinental road, presented his first memorial to Congress on a proposed national railroad connecting the Atlantic and Pacific Oceans. Heated debates on the selection of a particular route and its eastern terminus took place in both houses of Congress for the period from 1845 to 1862. A useful notation on these "Early Congressional Debates and Presidential Messages on the Pacific Railroad" appears as an appendix to the Bureau of Railway Economics Library's *A List of References Relating to the Union Pacific System*. The speeches of many of the prominent citizens who actively participated in these debates, such as those by Daniel Webster, Thomas Hart Benton, and Isaac I. Stevens, are recorded in the *Congressional Globe* for these years and can be readily found through its indices.

The sectional and local rivalry became so intense that Congress instructed the Secretary of War, Jefferson Davis, to implement a series of surveys that would compare the merits of the competing routes. The result was the massive twelve-volume *Reports of Explorations and Surveys to Ascertain the Most Practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean*, issued from 1855 to 1860 as congressional documents of both houses (Volumes 1-11 were printed as 33d Congr., 2d Sess., *House Ex. Doc. No. 91* and *Senate Ex. Doc. No. 78*; Volume 12 was printed as 36th Congr., 1st Sess., *House Ex. Doc. No. 56* and 35th Congr., 3d Sess., *Sen. Ex. Doc. No. 46*). These remarkable *Pacific Railroad Reports* provide painstakingly detailed descriptions of the topography, geology, minerals, zoology, vegetation, Indian life, and the like, of the vast *terra incognita*. The major reconnaissance routes (along the forty-seventh and forty-ninth parallels; the thirty-eighth and thirty-ninth parallels; the thirty-fifth parallel; the thirty-second parallel) and their respective survey parties are outlined by George Leslie Albright in his *Official Explorations for Pacific Railroads* (Berkeley, Calif., University of California Press, 1921; *University of California Publications in History*, Vol. 11). Albright's work is especially useful for his references to the

numerous congressional memorials, petitions, resolutions, and reports that document the entire transcontinental railroad episode. A more critical analysis of the surveys is presented by William H. Goetzmann in his *Army Exploration in the American West, 1803-1863* (New Haven, Yale University Press, 1959).

The Civil War gave rise to a series of reports detailing the wartime operations of the railroads, and the postwar period saw accounts settling the claims made by the land-grant railroads for their work in transporting troops and stores for the government. One of the best descriptions of wartime damages in the South is the report on the *Affairs of Southern Railroads* (39th Congr., 2d Sess., *House Rept. No. 34*, 1867). The next decade witnessed the continuous expansion of roads into networks and the amalgamation of railroad properties into huge empires to the disadvantage of the agrarian population. Accumulated outcries from this community brought the situation to a head and led in part to the investigations of the financial and related practices of the large companies that culminated in the institution of the Interstate Commerce Commission. Interested readers can find additional bibliographical citations to the large number of congressional documents that detail this history of government aid and regulation in Lewis Henry Haney's *A Congressional History of Railways in the United States* (Madison, Wis., 1908-10; *University of Wisconsin Bulletin*, Nos. 211 and 342; *Economics and Political Science Series*, Vol. 3, No. 2, and Vol. 6, No. 1). Benjamin Perley Poore's *A Descriptive Catalogue of the Government Publications of the United States, 1774 to 1881* (48th Congr., 2d Sess., *Sen. Mis. Doc. No. 67*, 1885), although somewhat cumbersome to use, contains the most comprehensive listing available of documents on railroads for the period covered.

Most of the states had established commissions to oversee the operations of their railroads and the periodically issued reports of these regulatory bodies are an important source of information on the construction, financial status, administration, and even contemporary public opinion on the various roads and systems. Many of these reports were published over

long periods of time, for instance the *Annual Report on the Railroads of the State* was issued by the New York State Engineer and Surveyor from 1849 to 1882, and the *Annual Report of the Railroad Corporations in Massachusetts* of the Massachusetts General Court from 1833 to 1869 (and by the Massachusetts Board of Railroad Commissioners from 1871 to 1895). These and other annual and special reports and proceedings of railroad conventions are listed in a separate section devoted to commissions in Teggart's *Catalogue of the Hopkins Railway Library*. For those states covered (California, Delaware, Illinois, Kentucky, Maine, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, and Vermont) Adelaide R. Hasse's truly monumental *Index of Economic Material in Documents of the States of the United States* (Washington, Carnegie Institution of Washington, 1907-22; 13 volumes) is an excellent entry into the contents of innumerable administrative and legislative reports of state bodies. Less exhaustive in scope but also of value for locating pertinent state documents is R. R. Bowker's four-volume *State Publications* (New York, Publishers' Weekly, 1899-1908).

The government did not attain its present position as an authoritative compiler of statistics until the creation of the Interstate Commerce Commission called for a systematic examination of railroad operations and procedures. An early attempt at collecting statistics is William H. Jones's compilation of "Railroad Statistics of the United States," comprising a section of the *Report of the Secretary of the Treasury on the State of the Finances for the Year ending June 30, 1856* (34th Congr., 3d Sess., *House Ex. Doc. No. 2*). Similar data on railroad construction, mileage, and finance appear in the publications of the seventh (1850) and later censuses.

It is, however, to the writings of Henry Varnum Poor, "grandfather of railroad statistics," that the researcher must turn for reliable data on nineteenth-century railroad operations and finance. Poor's services to the business community are ably documented by Alfred D. Chandler in his most readable *Henry Varnum Poor: Business Editor, Analyst, and Reformer* (Cambridge, Mass., Harvard University Press,

1956). As editor of the *American Railroad Journal*, Poor was very much concerned with the dissemination of accurate information on American railroads for the benefit of the industry and its supporting investors, bankers, and financiers. His *History of the Railroads and Canals of the United States of America*, Vol. 1 (1860) was to a large degree based on the returns of a detailed questionnaire which he prepared and sent to the president of every known railroad company in the country. The *History* itemizes the names and addresses of key company officers and directors, tabulates the length of the roads, summarizes the construction and legal history, and provides a good deal of miscellaneous financial data. In 1868 Poor's landmark *Manual of Railroads of the United States* commenced publication as an annual handbook of concise information on the "line of road," "rolling stock," "operations and general balances," and "officers and directors." Since the included figures generally span a period of several years, comparisons and overviews of American railroad dynamics are permitted. Poor took much interest in the preparation of the evaluative "Sketch[es] of the Rise, Progress, Costs, Earnings, Etc. of the Railroads of the United States" that introduce each *Manual*. Several of these essays carry long historical summaries on the railroad industry and its impact on the economy of the country. Toward the latter part of the century the greatly improved facilities of the federal government for collecting, organizing, and disseminating statistical data came to light with the establishment of the Bureau of Statistics in the Treasury Department and the institution of the United States Commissioner of Railroads, each of which issued periodic reports. In addition, Armin E. Shumin's survey of "Railroads in the United States" appeared in the transportation volume of the Census of 1880. In 1887 the Interstate Commerce Commission began to issue its *Annual Reports* and 1889 saw the first of its annual *Statistics of Railways in the United States*. Other important federally sponsored statistical sources are briefly commented on in Miss Cullen's 1937 review article in the *Bulletin* of the Railway and Locomotive Historical Society.

The contemporary periodical literature is a prime source of information on virtually all aspects of railroad growth and expansion. Journals such as the *American Railway Times*, *Railroad Record*, *Railroad Advocate*, *United States Railroad and Mining Register*, *Western Railroad Gazette*, and the *American Railway Review* came into being at mid-century when public interest in construction and extension was gathering momentum. Twenty years later the *Railroad Gazette* (formerly the *Western Railroad Gazette*) and *Railway Age* rose to the fore, and both are considered noteworthy research tools. News of a personal and general nature, reports issued by the railroad companies, notes on new roads, extensions, and equipment, specifications and illustrations of new patents, changes in shipping rates, descriptions of accidents, wrecks, and new safety mechanisms, all of which were consistently reported, shed much light on the technology and ideology of the times. The *American Railroad Journal* had, of course, a long tradition of providing information of value to the engineer, and when under the editorship of Henry Varnum Poor, to the financier and investor. These journals, with their entertaining accounts of train trips along scenic routes, picturesque advertisements, and editorial endorsements of hotels "deserving of railway patronage" make for much enjoyable reading. Among the more general business periodicals that also carried material on the railroads, *Hunt's Merchants' Magazine* and *De Bow's Commercial Review of the South and West* (later the *Commercial and Financial Chronicle*) should receive special mention. The names of other early journals can easily be obtained from the Bureau of Railway Economics' *Railway Economics* and Teggart's *Catalogue of the Hopkins Railway Library*.

In our day the *Bulletin* of the Railway and Locomotive Historical Society, originating at the Baker Library of Harvard Graduate School of Business Administration, is an outstanding forum for studies of a historical nature. It features both popular and scholarly articles ("The Muddle of the Gauges," *Bulletin No. 47*, 1938; "The United States Military Railroads," *Bulletin No. 108*, 1963; "The North-South Railroads of America," *Bulletin No. 113*, 1965) and a number of

book-length monographs ("The Story of the Florida Railroads, 1834-1903," *Bulletin No. 86*, 1952, and "Locomotives of the Southern Pacific Company," *Bulletin No. 94*, 1956). For many years staff members at the Bureau of Railway Economics Library have been responsible for preparing the *Bulletin's* bibliographical section, "Worth Reading," a list of recent books, pamphlets, government documents, and periodical articles. Another periodical of value to the serious student is the mimeographed "*Letter*" to the members of the Lexington Group, an informal association of railroad historians. This Group convenes annually with the Organization of American Historians, at which time scholarly papers are presented. Its members keep themselves informed of pertinent research projects, conferences, and new books and articles by means of this *Letter*. At the present time the secretary is Howard F. Bennett, at the School of Business of Northwestern University, in Evanston, Illinois. On a less scholarly level, most railroad buffs are aware of the kind of historical material contained in the large number of popular and trade periodicals, such as *The Railroad Enthusiast*, *Railway History Quarterly*, *Pacific Railway Journal*, and *Trains*.

Another essential tool for historical studies is the railroad map. A good place to find a map picture of the remarkable expansion of the network of roads from 1840 to 1880 is Charles O. Paullin's *Atlas of the Historical Geography of the United States* (Washington, Carnegie Institution of Washington; New York, American Geographical Society, 1932; Carnegie Institution of Washington, *Publication No. 401*). An especially helpful explanatory text identifies the sources of the data used in the compilation of the maps. Included in this source material are many of the maps drawn by Henry V. Poor for the *American Railroad Journal*, the maps that appeared in the early railroad timetables and guides, such as *Appleton's Illustrated Railway and Steam Navigation Guide* and the *Travellers' Official Railway Guide* (later the *Official Railway Guide*), the statistical data contained in Poor's *History* and his *Manuals*, and the census publications. Another outstanding Carnegie Institution publication, MacGill's *His-*

tory of *Transportation in the United States before 1860*, includes several maps that represent roads in operation in 1840, 1850, and 1860 and discusses the authorities consulted in the map compilation. Scores of contemporary maps contained inaccuracies, owing largely to the lack of differentiation between proposed roads and those in construction or actually in operation. Frederic L. Paxson, in his "The Railroads of the 'Old Northwest' before the Civil War" (*Transactions of the Wisconsin Academy of Sciences, Arts, and Letters*, Vol. 17, Pt. 1, 1914, p. 247-274), is also concerned with the errors found on the early maps and in the compilations of statistics. His series of maps depicting railroads in operation from 1848 to 1860 is based on the contemporary evidence of construction, as reported in the *American Railroad Journal*, the reports of the companies, the distances between stations tabulated in the timetables and guides, local newspapers, county histories, and the like.

Since there is no bibliography specifically devoted to nineteenth-century railroad maps, the printed catalogues of the large map libraries must be combed for pertinent references. The British Museum's recently published *Catalogue of Printed Maps, Charts, and Plans* (London, 1967) includes a good-sized list under its "United States—Railway Maps" that dates from 1848. The standard cartobibliographies of the Library of Congress (Philip Lee Phillips' *A List of Maps of America in the Library of Congress*, 1901, and his *A List of Geographical Atlases . . . and its supplements*) should also be consulted. A number of railroad route maps are listed in Richard S. Ladd's *Maps Showing Explorers' Routes, Trails & Early Roads in the United States: An Annotated List* (Washington, Library of Congress, Map Division, 1962). Soon to be published in book form by G. K. Hall & Co. is the *Dictionary Catalogue* of the Map Division of the New York Public Library. In the American Geographical Society Map Department's *Index to Maps in Books and Periodicals* (Boston, G. K. Hall, 1968) references are to the maps that illustrate historical monographs and periodical articles on railroad history. The Bancroft Library at the University of California, Berkeley,

offers its *Index to Printed Maps* (Boston, G. K. Hall, 1964) as a finding aid for railroad maps of California and the western part of North America.

The maps prepared for the *Pacific Railroad Reports* are analyzed in detail by Carl I. Wheat in his awesome *Mapping the Transmississippi West, 1540-1861*, Vol. 4, *From the Pacific Railroad Surveys to the Onset of the Civil War* (San Francisco, Institute of Historical Cartography, 1960). These noteworthy maps and profiles, most of which were published in the eleventh volume of the *Reports*, were prepared by the survey parties led by Governor Isaac I. Stevens, Lieutenants R. S. Williamson, H. L. Abbot, E. G. Beckwith, A. W. Whipple, and J. G. Parke, and Captain John Pope. Special attention is directed to Lieutenant Gouverneur Kemble Warren's famed "Map of the Territory of the United States from the Mississippi to the Pacific Ocean Ordered by the Hon. Jefferson Davis, Secretary of War, to Accompany the Reports of the Explorations for a Railroad Route . . ." Wheat reproduces in facsimile a number of the more important of these maps. The original cartographic records of these surveys were transferred from the Office of Explorations and Surveys in the War Department to the Department of the Interior and are presently maintained in the United States National Archives. Laura E. Kelsay describes these annotated printed and manuscript records in her *Preliminary Inventory of the Cartographic Records of the Office of the Secretary of the Interior, Record Group 48* (Washington, 1955; *Preliminary Inventory*, No. 81).

The information on these maps provided the basis for many of the railroad maps of the western territory that appear in the commercial and railroad atlases of the last quarter of the nineteenth century. It is interesting to remember that one of the leading map publishers of our day, Rand McNally & Co., entered the field of publishing as a producer of railroad materials, including maps. To celebrate its centennial year it issued, in 1956, the *Pioneer Atlas of the American West*, containing facsimile reproductions of maps in the 1876 edition of its *Business Atlas of the Great Mississippi Valley and Pacific Slope*, together with some contemporary railroad maps and travel literature. *Asher & Adams' New Columbian Railroad*

Atlas (New York, 1875), *Grant's Rail Road & Business Atlas* (New York, 1886), and the various editions of *Scribner's Statistical Atlas of the United States* are examples of other early atlases with railroad maps. Many separately issued maps are listed in the previously mentioned bibliographies, especially those compiled by Thomson, Teggart, Hasse, and the Bureau of Railway Economics.

One of the more pleasant ways to absorb railway history is to surround oneself with albums of photographs and other illustrations. During the 1850's artists were among the party of Army engineers and scientists that carried out the trans-continental surveys for the government, and their work is evident in the beautiful plates that illustrate the *Pacific Railroad Reports*. Robert Taft focuses on these panoramic views and illustrations of the fauna, flora, and the like, and the artists that created them in his "Illustrators of the Pacific Railroad Reports" (*Kansas Historical Quarterly*, Vol. 19, No. 4, November, 1951, p. 351-380) and his "John M. Stanley and the Pacific Railroad Reports" (*Ibid.*, Vol. 20, No. 1, February, 1952, p. 1-23). Scenes of immigrants waiting at railroad stations, Civil War hospital trains bearing wounded soldiers, railroad ceremonies and balls, parades, crowds, and strikes are featured in *Hear the Train Blow: A Pictorial Epic of America in the Railroad Age* (New York, Dutton, 1952) and *The Age of Steam: A Classic Album of American Railroadings* (New York, Rinehart, 1957), both assembled by Lucius Beebe and Charles Clegg. In George Abdill's *Pacific Slope Railroads from 1854 to 1900* (Seattle, Superior, 1959) and his *Rails West* (Seattle, Superior, 1960) emphasis is on the locomotive and its crew. Many regional textual histories, such as David F. Myrick's *Railroads of Nebraska and Eastern California* (Berkeley, Calif., Howell-North, 1962-63) are richly illustrated with early photographs. The titles of additional pictorial works can easily be found through the card catalogues of libraries or, if purchase is intended, the sales catalogues of specialized railroad publishers (Kalmbach, Trans-Anglo, Howell-North, etc.).

Some acquaintance with the libraries that conserve and make available these federal and state documents, early runs

of periodicals, company reports, association proceedings, books, pamphlets, newspapers, maps, photographs, and prints is, of course, necessary for the student. Several of the larger collections are briefly described in an issue of *Special Libraries* (Vol. 46, No. 2, February, 1955), assembled by the Transportation Division of the Special Libraries Association. Included are the Bureau of Railway Economics Library and the General Office Library of the Pennsylvania Railroad Company, in Philadelphia. Thirty years earlier another issue of *Special Libraries* (Vol. 16, No. 2, February, 1925) featured several articles on transportation, including Elizabeth Cullen's still useful "Source Material on Railroad History." The Bureau of Railway Economics' *The Railroads' Library* (1942) is an account of the holdings and special catalogues of this superb collection. Other libraries with significant resources are the Baker Library of the Graduate School of Business Administration at Harvard University, the John Crerar Library, the Transportation Center Library at Northwestern University, the Henry E. Huntington Library, the University of California (Berkeley), the University of Illinois (Urbana), the University of Michigan, the Engineering Societies' Library, New-York Historical Society, New York Public Library, and the Library of Congress. Brief descriptions (and addresses) of most of these can be found in Kenneth N. Metcalf's *Transportation: Information Sources* (Detroit, Gale Research Company, 1966; *Management Information Guides*, 8). Many of the libraries issue periodic lists of accessions (*e.g.*, Northwestern University, Bureau of Railway Economics, Baker Library) and several have had their card catalogues photoduplicated and published in book form (*e.g.*, the *Catalog of Printed Books* of the Bancroft Library, University of California (Boston, G. K. Hall, 1964) and the Engineering Societies' Library *Classed Subject Catalog* (Boston, G. K. Hall, 1963). These accession lists and book catalogues are excellent sources of current and retrospective bibliographical references, frequently yielding citations seldom found elsewhere.

A group of experienced and knowledgeable librarians, the Ad Hoc Committee of Librarians, joined together to prepare

Sources of Information in Transportation (Evanston, Ill., Northwestern University Press, 1964), an exceptionally helpful reference volume that was published for the University's Transportation Center. The chapter on railroads is by Helene Dechief, Librarian of the Canadian National Railways, in Montreal. Another library publication of merit is William R. Siddall's *Transportation Geography: A Bibliography* (Manhattan, Kan., Kansas State University Library, 1967; *Bibliography Series*, No. 1, Rev.).

The voluminous archival records in the possession of the railroad companies constitute virtually untapped source material for the scholar. In an attempt to promote the use of railroad archives, Richard C. Overton, the eminent railroad historian, focuses his "Some Sources for Northwest History: Railroad Archives" (*Minnesota History*, Vol. 23, No. 1, March, 1942, p. 52-56) on the available records that are generally scattered throughout the various divisions of a company. Corporate records (charters, minutes of directors' and stockholders' meetings, annual and special reports, land-grant records, contracts, corporate leases, deeds), he finds, are usually under the jurisdiction of the secretary, while the surveys, maps, and records of construction may be located in the engineering department. Other records may be housed in the legal, land and taxation, personnel, and accounting and treasury departments. The geographer Donald W. Meinig relates his research experiences with the archives maintained by the Northern Pacific Railway Company, in St. Paul, and the Union Pacific Railroad Company, in Omaha, in his "Research in Railroad Archives" (*Pacific Northwest Quarterly*, Vol. 47, No. 1, January, 1956, p. 20-22). His "Railroad Archives and the Historical Geographer" (*The Professional Geographer*, Vol. 7, No. 3, May, 1955, p. 7-10) is an outline of the available materials on railroad construction, internal operations, and the role of the railroad in regional development.

In 1943 the Chicago, Burlington & Quincy Railroad Company and the Illinois Central Railroad deposited the bulk of their early records in the Newberry Library, in Chicago. Several years later the Library published two expertly compiled indices to these files: *Guide to the Burlington Archives in the*

Newberry Library, 1851-1901, by Elisabeth Coleman Jackson and Carolyn Curtis (1949) and *Guide to the Illinois Central Archives in the Newberry Library, 1851-1906*, by Carolyn Curtis Mohr (1951). Other repositories of railroad material (university and public libraries, historical societies, museums, etc.) may be readily identified by use of the *National Union Catalog of Manuscript Collections*, issued in serial form from 1962 to the present. The 1967 volume contains a cumulative subject index for the period from 1963 to 1966, with numerous entries on railroad history, land grants, logbooks, pictures, surveying, travel, as well as on individuals, states, and companies.

The specialized museums devoted to railroads and transportation in general also house materials of interest to both rail fan and scholar. The title of P. M. E. Erwood's *The Railway Enthusiast's Guide to Railway Societies and Clubs, Museums, Preserved Locomotives, Railway Books, and Periodicals, Etc., Etc., in Over 40 Countries* (2d ed., Sidcup, Kent, Lambarde Press, 1962) is self-explanatory. Its section on the United States contains brief descriptions of notable museums, such as the Union Pacific Historical Museum, in Omaha, the National Museum of Transport, in St. Louis, and the Colorado Railroad Museum, in Golden. Others may be found by consulting the Association of American Railroads' *List of Steam Locomotives on Display in the United States* and the more general *Museums Directory of the United States and Canada* (2d ed., Washington, American Association of Museums and the Smithsonian Institution, 1965).



